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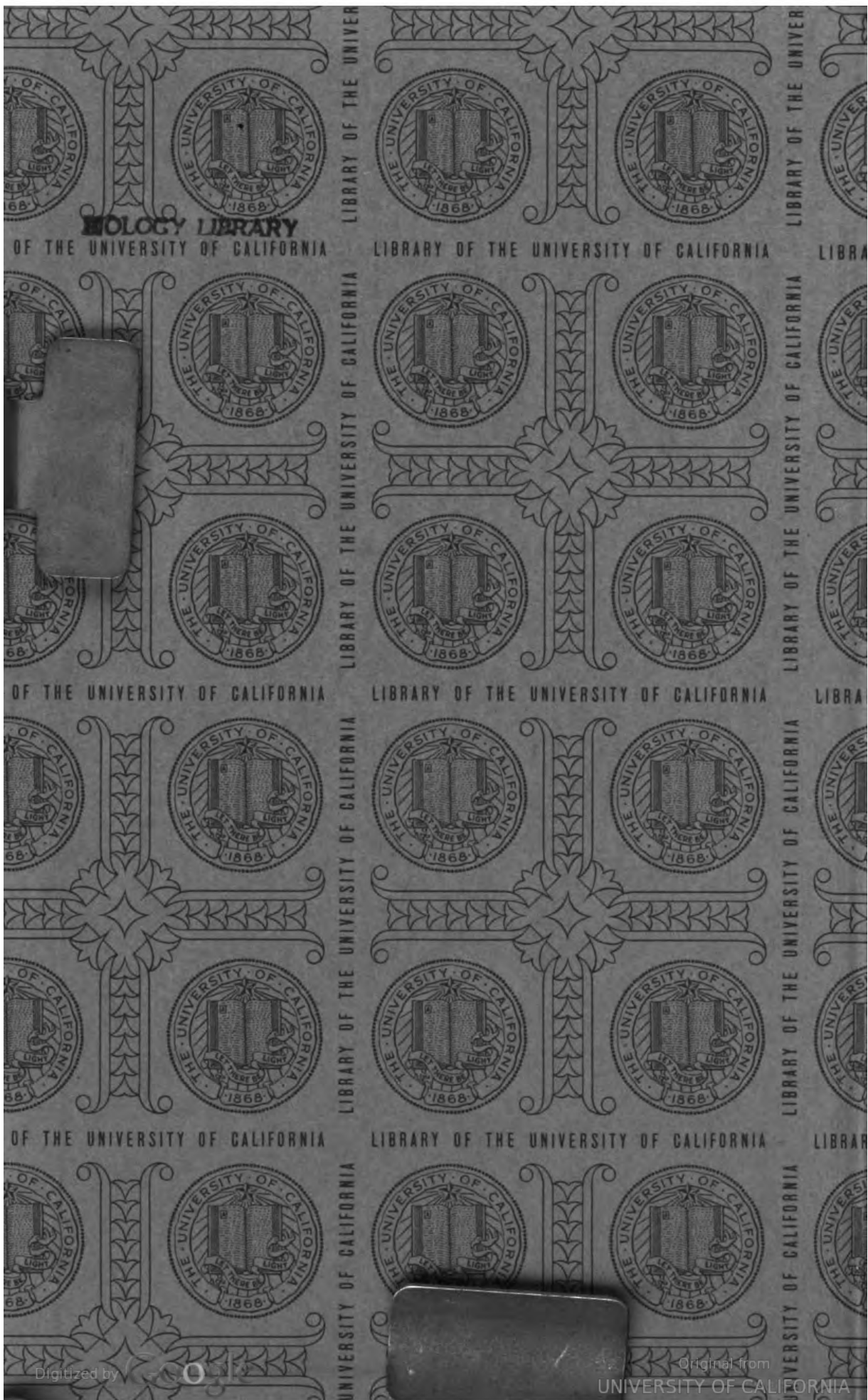


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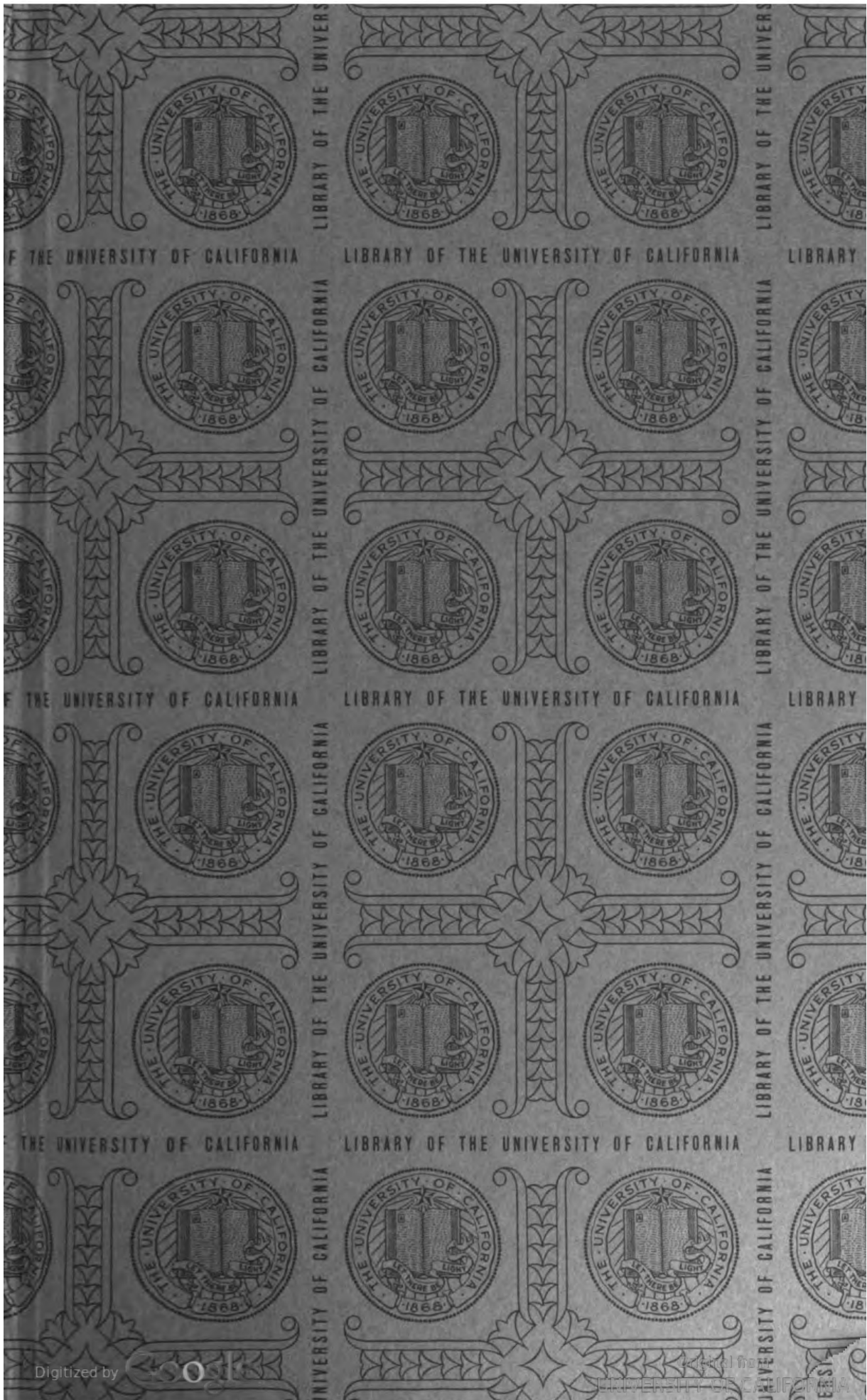
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January-February 1949

Volume 49—Number 1

UNITED STATES

Naval Medical Bulletin



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COVER PHOTOGRAPH

Comdr. James A. Murphy (MC) U. S. N., leaves deck of battleship "Missouri," handhold fashion, to board the hovering helicopter for transfer to the carrier "Leyte" (left background) to attend a Marine who was struck by a whirling propeller during air operations in recent North Atlantic maneuvers.

—Official U. S. Navy Photo.

Vol. 49

JANUARY-FEBRUARY 1949

No. 1

UNITED STATES NAVAL MEDICAL BULLETIN

THE MISSION OF THE MEDICAL DEPARTMENT OF THE NAVY
TO KEEP AS MANY MEN AT AS MANY GUNS
AS MANY DAYS AS POSSIBLE



BIMONTHLY

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BUREAU OF MEDICINE AND SURGERY

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NAVY DEPARTMENT,
Washington, March 20, 1907.

THIS UNITED STATES NAVAL MEDICAL BULLETIN is published by direction of the Department for the timely information of the Medical and Hospital Corps of the Navy.

TRUMAN H. NEWBERRY,
Acting Secretary.



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PREFACE



The UNITED STATES NAVAL MEDICAL BULLETIN was first issued in April 1907 as a means for supplying Medical Department personnel of the United States Navy with information regarding the advances which are continually being made in the medical sciences, and as a medium for the publication of accounts of special researches, observations, or experiences of individual medical officers.

With the establishment of the Nurse Corps in 1908, the Dental Corps in 1912, and the Medical Service Corps in 1947, the function of the BULLETIN was broadened to serve in a similar capacity for members of those Corps.

It is the aim of the Bureau of Medicine and Surgery to furnish in each issue special articles relating to naval medicine and dentistry, editorial comment on current literature of special professional interest to Medical Department personnel, clinical notes on interesting cases, descriptions of suggested devices, reports from various sources, notes and comments on topics of professional interest, and notices of newly published professional books.

The Bureau extends an invitation to all officers of the Medical Department to prepare and forward, with a view to publication, contributions on subjects of professional interest.

The Bureau does not necessarily undertake to endorse views or opinions which may be expressed in the pages of this publication.

CLIFFORD A. SWANSON,
Surgeon General, United States Navy.

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The editor is not responsible for the safe return of manuscripts and pictures. All materials supplied for illustration, if not original, should be accompanied by reference to the source and a statement as to whether or not reproduction has been authorized. Recognizable photographs of patients should carry with them permission to publish.

All original contributions are accepted on the assumption that they have not appeared previously and are not to be reprinted elsewhere and that editorial privilege is granted to the Bureau of Medicine and Surgery in preparing all material submitted for publication. Authors are urged to keep their papers short.

JOSEPH L. SCHWARTZ, *Editor,*
Captain, Medical Corps,
United States Navy,

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Fellow Officers of the Medical Department:

The dangerous and often lethal effects of X-radiation have been known since the discovery of this form of energy by Roentgen. In the past, protective measures have been necessary only for those working with or near apparatus emanating such energy.

The amazing and epoch-making achievements in nuclear fission by scientists in this country and the resultant awe-inspiring events at Hiroshima and at Bikini have thrust upon the Medical Department the problem of how to protect all our personnel from the deleterious or deadly effects resulting from the military use of this most potent agent. This new use of atomic energy has opened up for consideration and study vast unexplored fields in medicine and preventive medicine, for added to the problem of caring for large numbers of simultaneously incurred casualties will be the complicating factor of X-radiation.

Many new problems require investigation among which are: measures for decontamination of personnel and materiel; hematologic effects and the anti-coagulant factors of radiation; gamma-ray dosimetry; and metabolic effects of radioactive elements. These and many other considerations of importance to the health of personnel are under study at the U.S. Naval Medical Research Institute, National Naval Medical Center, Bethesda, Md., and at the Radiological Defense Laboratories at San Francisco.

Medical Officers at all levels are in training or engaged in this branch of research. We look forward to outstanding achievements in this work and to new methods that will be of great and lasting benefit to the physical welfare of all.

Sincerely,

A handwritten signature in cursive script, appearing to read "C. J. Swanson".

Rear Admiral, Medical Corps
Surgeon General, U.S. Navy

VIII

U. S. NAVAL MEDICAL BULLETIN

VOL. 49

JANUARY—FEBRUARY 1949

No. 1

ARTICLES



ANTIHISTAMINIC DRUGS IN THE THERAPY OF THE COMMON COLD¹

JOHN M. BREWSTER
Captain (MC) U. S. N.

ALTHOUGH the common cold is universally considered to be a minor affliction, its cost in days lost from employment has been reckoned at 100,000,000 a year (1) and the annual financial bill to the American public has been variously estimated at between 1 and 3 billion dollars (2). Although research has demonstrated a filterable virus as the causative organism (3) (4) as yet no specific treatment has been found (5) (6) and vaccines have not been generally accepted as being of benefit consistently (7). Despite this gloomy picture, it is believed that unusual promise for the future lies in the performance of some of the newer synthetic antihistaminic drugs as disclosed in the following report of a study of their effects in the treatment of the common cold. Their chemical structures, mode of action, therapeutic uses, and side actions have been well covered in articles by Feinberg (8) and Waldbott (10).

In a previous article (11) the unusually satisfactory results from the use of Benadryl as a therapeutic agent were reported. Encouraged by these findings, a new series was started in October 1947 to determine whether similar excellent results could be obtained with other antihistaminic drugs. "Clinics" or stations for the treatment of "colds" were established at three focal points on the compound. All hands including the civilian employees were encouraged to report

¹ Study made at U. S. Naval Hospital, Great Lakes, Ill.

for treatment at the earliest possible moment after the onset of a cold. Pyribenzamine, Thenylene, Neoantergan, and Histadyl as well as Benadryl, were included as the fundamental drugs used in the study. Since these drugs have a sedative effect, phenobarbital was first chosen as the control medication. However, it was hurriedly abandoned when the complaints of the recipients threatened the success of the study. The combination of codeine sulfate with papaverine hydrochloride, as advocated by Diehl (12) was then chosen as the control medication. It offered the advantage of being generally accepted as the preferred treatment for the common cold and thus provided a real criterion with which to compare the antihistaminic drugs.

The original objective was to determine the percentage of colds which could be aborted. As the series progressed it became plain that in spite of our best efforts most of our cases were going to be well-established colds; accordingly, therapy at any stage of a cold was undertaken. An effort was made to give the various drugs to patients in succession and without selection. Thus approximately every sixth patient received a control medication and an equal number of patients received one of the five drugs.

Patients were examined to exclude more serious diseases from the series. Because it is virtually impossible to make a differential diagnosis in the early stages of the acute upper respiratory infections (5) (6), the patient's diagnosis of a "cold" was accepted if the examining physician failed to find evidence to disprove it. This is in keeping with the conclusions reached by others (13).

Since the therapy under study was to consist of antihistaminic drugs it was considered important to determine whether or not any cures obtained occurred only in patients who were known to be allergic. Patients thus were quizzed as to previous existence of any manifestation of allergy, with emphasis on history of hay fever, asthma, eczema, migraine, chronic indigestion, periodic attacks of sneezing, and "sinus trouble."

Perennial allergic rhinitis as defined by Kern (14) and by Griep (15) was ruled out insofar as possible by history and examination. Smears of nasal secretions and differential blood counts were taken in a few cases late in the series to determine the presence of eosinophilia as an index to an allergic reaction. The number examined was too small to offer conclusive evidence, but there were cures in patients without eosinophilia.

The dose for adults was arbitrarily set at 50 milligrams for the antihistaminic drugs and at 16 milligrams each of codeine sulfate and papaverine hydrochloride for the control medication. Each patient was provided with enough medicine to carry him until the next

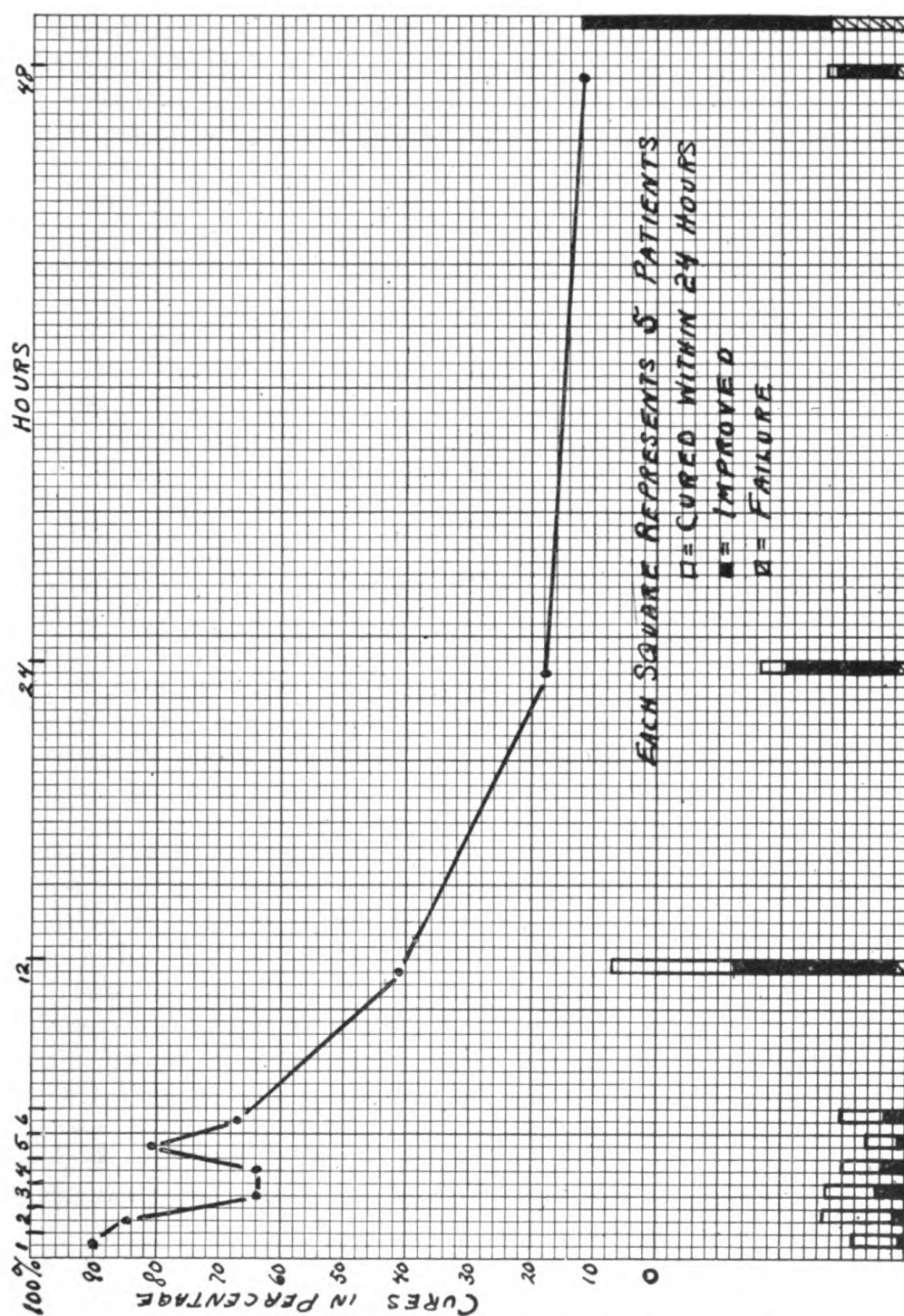


Figure 1.—Results of treatment with antihistaminic drugs.

morning and was instructed to repeat the doses at 4-hour intervals when awake, for at least 3 doses (more if symptoms persisted) and to report to the clinic the following morning. In order to establish their limitations as well as their therapeutic properties, no other medication was given with the antihistaminic drugs except stimulants to counteract their sedative effect. A 10-day follow-up check was made in most patients after discharge. Only ambulatory patients were treated in this series which included females as well as males. The youngest was 6 years of age and the oldest was 67. The group was made up of personnel attached to the hospital and included dependents and civilian workers.

A total of 572 patients were treated in the period from 1 October 1947 to 1 May 1948. A cold was considered to have been aborted or cured when all signs and symptoms disappeared completely within 24 hours of the beginning of treatment and remained absent for at least 48 hours after all treatment was stopped.

FINDINGS

All symptoms were aborted in 19 (90 percent) of the 21 patients in whom treatment with antihistaminic drugs was begun within the first hour after the onset of symptoms and in 48 (87 percent) of 55 patients treated within 2 hours of onset. One hundred and sixteen (74 percent) of 156 patients who received treatment within 6 hours, and 165 (70 percent) of 234 patients who received treatment within 12 hours of onset were also cured. The results are illustrated graphically in figure 1.

A total of 77 patients were used as controls. The first five were given 32 milligrams of phenobarbital every 4 hours for 3 doses. However, when all complained of marked drowsiness and that it failed to relieve any of their symptoms, its use was discontinued. The combination of codeine sulfate with papaverine hydrochloride was then adopted as the control medication. Within 1 hour after onset of symptoms a cure was obtained in one of the two patients to whom this combination was given. Cure was obtained in 5 (42 percent) of 12 patients who received treatment within 6 hours, and in 7 (31 percent) of 22 patients in whom treatment was begun within 12 hours. In none in which therapy was begun more than 24 hours after onset was a cure obtained. (See fig. 2.)

A personal history recorded in 393 of the 572 patients treated disclosed that 74 had suffered previously from some type of recognized allergic reaction. Data concerning the type of reaction and the effect of treatment in these cases are shown in table 1. There were 319 who gave no history of having had any type of allergy previously. Anti-

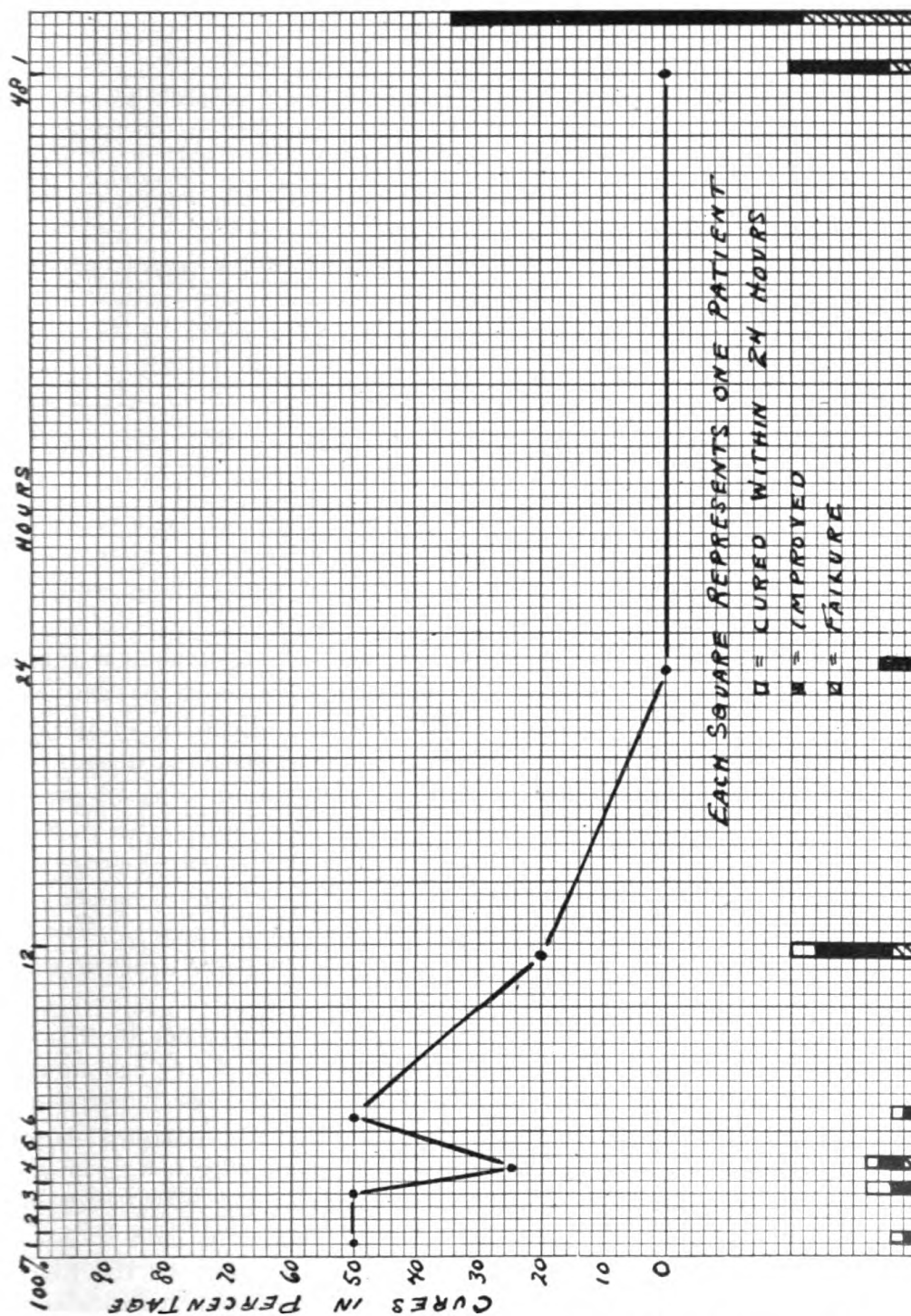


Figure 2.—Results of treatment with codeine sulfate and papaverine hydrochloride.

histaminic drugs were given as treatment to 262 of these, with cures in 105. In 57 given codeine sulfate and papaverine hydrochloride there were 5 cures.

TABLE 1.—*Effect of therapy in cases of common cold with personal history of allergy*

Type of allergy	Antihistaminic drugs		Codeine sulfate and papaverine hydrochloride	
	Cure	Palliative only	Cure	Palliative only
Asthma.....	1	1	1	1
Hay fever.....	4	11	0	3
Urticaria.....	18	14	1	3
Eczema.....	1	1	0	1
Migraine.....	3	1	0	0
Chronic rhinitis.....	1	1	0	0
Chronic sinusitis.....	2	1	0	0
Not recorded.....	4	1	0	0

It is conceded that the number of controls is small by comparison but adequate (it is hoped) to conclusively demonstrate the superiority of the antihistaminic drugs in the treatment of the common cold in its initial stages.

In three patients treated personally by the writer, earache was an early (within 12 hours) symptom. Inspection disclosed marked injection of the periphery of the involved ear drum. Both the symptom and sign disappeared after three doses of an antihistaminic drug.

All of the antihistaminic drugs studied were found to be effective in aborting colds when taken within the first few hours after onset. In the majority of patients who received the antihistaminic drugs as the sole therapy and where treatment was begun too late to secure an arrest, the resultant colds were of short duration (3 to 5 days). These colds were remarkable because of the absence of complications and the mildness of the symptoms.

As a result of the small dose used, and the short periods in which treatment was required, there were no instances of severe reactions, severe side actions, or toxemia. Side actions noted were drowsiness, and dryness of the mouth; infrequently, headache and dizziness; and, rarely, nausea. A variation in severity of the drowsiness was noted. Benadryl had a pronounced sedative effect in almost every case in which it was used. This was found to be an asset in patients willing to remain in bed during treatment or when used only as the final night dose of antihistaminic drug in any case. However, it was a real hazard in ambulatory patients when more than one dose was taken. Pyribenzamine, Thenylene, and Histadyl all produced a moderate degree of sedation. Neoantergan was found to have little or no sedative effect in the majority of cases in which it was given, and thus

became the favorite medication of the ambulatory patients who had had experience with any of the other antihistaminic drugs. All were warned that drowsiness was to be expected and were cautioned to avoid driving a car while under treatment.

To combat the sedative effect, racemic amphetamine sulfate (Benzedrine) in 2.5 to 5 mg. doses or dextro-amphetamine (Dexedrine) in 5 to 10 mg. doses were frequently given with the initial dose of antihistaminic drugs whenever treatment was begun before 4 o'clock in the afternoon. These effectively reduced the sensation of drowsiness in most cases and had the happy effect of lifting many patients out of the mild mental depression that is often a symptom in colds. Benzedrine should not be prescribed in the presence of arterial hypertension, cardiovascular disease, or nervous tension; and to avoid wakefulness at night, neither drug should be taken later than 4 o'clock in the afternoon (16).

One patient, whose wife had had Benadryl prescribed for hay fever elsewhere, in his enthusiasm took 200 mg. of Benadryl within a period of 4 hours. He became disoriented and confused for a short period of time but recovered completely following a night's sleep. Another patient, with an active chronic duodenal ulcer, was as much impressed with the relief he obtained from ulcer symptoms as by the abortion of his cold.

It has been established that an attack of the common cold provides an immunity lasting from 3 to 7 weeks (17). It was observed in this study that even the very mild and attenuated colds that resulted from prompt and continued treatment with the antihistaminic drugs conferred a normal degree of immunity. It was further observed that the cure of a cold became progressively more difficult the longer the time interval separating the present attack from the last cold experienced, and that, lacking immunity in the presence of an epidemic, the treatment frequently had to be repeated at 2- to 5-day intervals. Thus, it would seem that when a cold is aborted, we actually postpone it, and that eventually it might become wiser to accept (conceivably select) a mild variety and treat it early and carefully to obtain the immunity it will confer.

DISCUSSION

The medical literature of the past 2 years contains many reports of the favorable results obtained with the antihistaminic drugs in treatment of a wide variety of allergic conditions. From this fact, and from the phenomenal cure of the very early colds, it is assumed that the common cold begins as an allergic reaction. This assumption is supported considerably by the pronounced similarity of the symptoms of an acute head cold to those of that other typical allergic reaction, hay fever.

That under normal conditions most individuals harbor pathogenic bacteria in their respiratory organs was demonstrated long ago (18) (19) (20). The phenomenon of these pathogenic organisms suddenly assuming accelerated growth and invasive characteristics in the presence of the virus infection of the common cold might well be as follows: (a) cold virus present in upper respiratory tract; (b) trigger mechanism (chilling, ingestion of food or drink to which one is sensitive, inhalation of irritant); (c) allergic reaction producing edema or the mucous membrane of the respiratory tract (localized and patchy); (d) loss of normal protective power by the thus damaged mucous membrane, which in turn provides a culture medium for the virus and pathogenic organisms; (e) invasion of the body by pathogenic organisms causing complications of the common cold. Assuming the above to be correct, then the common cold is aborted or cured when the allergic reaction is reversed before irreparable damage has been done to the respiratory mucous membrane. This theory also offers a possible explanation of the variation in susceptibility to colds observed among members of any large group of individuals.

Figure 1 graphically demonstrates that timeliness is of prime importance in the successful treatment of the common cold with antihistaminic drugs, and that the effectiveness of the treatment is inversely proportional to the lapse of time following the onset of symptoms before treatment is begun. This feature limits their usefulness. Even in this series where treatment was free, the clinics almost as conveniently located as drinking fountains, and with considerable publicity and insistent urging that patients report for treatment early, the average patient and 75 percent of those under 25 years of age did not report for treatment until 48 hours after the onset of symptoms. Early treatment was sought by those to whom a cold had become a serious illness, a threat to their jobs or to their social plans. This may prove to be the case generally, but the treatment with antihistaminic drugs should prove invaluable to patients already seriously ill or injured, to the aged, to statesmen, to concert, radio, and movie artists, in large industrial plants, and, conceivably, in certain military or naval operations where manpower is at a premium and where personnel can be controlled. It is believed that real progress in the elimination of the common cold will be made when and if an antihistaminic drug which is effective and yet sufficiently safe to permit the public to purchase it without a prescription is developed.

There will be many who will quite properly challenge the possibility of diagnosing a cold within the first hour of symptoms. When one has been as unusually susceptible to colds all his life as the writer has been, and then lives an entire year without a cold as he has done by the simple expedient of taking one or two doses of an antihista-

minic drug at the first hint of a cold, the problem of diagnosis becomes academic. This was accomplished despite the fact that exposure to acute colds was an almost daily occurrence in his "clinic" for colds.

It is ventured that the elimination of the factors responsible for the spread of colds; the sneezing, coughing, and profuse discharge from the nose, should operate to eliminate a large proportion of the colds that now occur. This we know the antihistaminic drugs will do, in most cases, at any stage of a cold. What the eventual effects of prolonged use of these drugs will be remains to be seen; however, after over 2 years of rather wide usage, the literature is not yet burdened with adverse reports.

Patients were cautioned and carefully observed during their first course of treatment and when there was assurance that no untoward side actions had been experienced, a small additional amount of the drug, to be kept by the patient for use in aborting future colds, was prescribed. This practice proved unwise from the standpoint of collecting statistics. During late January and February the number of cases appearing at the clinics declined markedly. Investigation disclosed that former patients were not only aborting their own colds, but those of their families and friends.

CONCLUSIONS

1. It is believed that the initial phase of the common cold is an allergic reaction.

2. Antihistaminic drugs, by interrupting this allergic reaction, are capable of aborting the common cold when treatment is begun in the initial phase.

3. The effectiveness of these drugs in the treatment of the common cold is not dependent upon the sedative effect common, to a greater or lesser degree, to them all.

4. Two or three doses of these drugs at 4-hour intervals are adequate to effect an abortion of symptoms in 90 percent of the cases when treatment is instituted within a few hours after onset. Failing this, their continued use as palliative treatment shortens the period of morbidity and eliminates many complications.

5. Complications of colds should be treated with penicillin, the sulfa drugs, or surgery as required.

6. The antihistaminic drugs should prove invaluable in the control of the contagion of the common cold when and if adopted as treatment by the majority or in groups that can be controlled, such as military or naval personnel.

SUMMARY

In a series of 572 patients with common colds, 19 (90 percent) of 21 patients in whom treatment with the antihistaminic drugs was

begun within the first hour after onset of symptoms were cured. In 116 (74 percent) of the patients in whom treatment was begun within 6 hours of onset of symptoms a cure was obtained. It was the consensus of the group receiving antihistaminic drugs that these constituted excellent treatment. The effectiveness of the treatment is inversely proportional to the lapse of time following the onset of symptoms before treatment is begun. Statistics from parallel controls treated with codeine sulfate and papaverine hydrochloride suffered by comparison. In one patient in the series symptoms of a temporarily incapacitating side action occurred from a self-administered overdose of antihistaminic drug.

From the results achieved, it is believed that the incidence of the common cold will be reduced to a startling degree when the antihistaminic drugs are more widely prescribed for early medication of colds, much as aspirin is at the present time. These new drugs, by their action, eliminate the sneezing, coughing, and the profuse discharge from the nose which now is left invisibly on door knobs, faucet handles, hand rails, in the air we breathe, and on other places of contact. If properly and universally used, the antihistaminics could reduce the incidence of colds to near the vanishing point.

The abortion of the common cold is so truly unique, it must be experienced to be appreciated.

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DICUMAROL THERAPY OF ACUTE CORONARY THROMBOSIS

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FOR a number of years the anticoagulants, dicumarol and heparin, have been used in a variety of thrombo-embolic states with considerable success in reducing the mortality and morbidity of these conditions. The pathogenesis of acute coronary thrombosis and the complications occurring during the convalescence from such attacks seem to indicate the probable efficacy of anticoagulants in this condition. The first clinical study of the use of dicumarol in the treatment of acute coronary thrombosis was published by Nichol and Page in January 1946 (33). During the ensuing years several other reports of the clinical investigation of this subject appeared (21) (36) (37) (42), and considerable work is in progress in this field at the present time.

The rationale of the use of anticoagulants in this condition is: (a) the prevention of the propagation of the initial coronary thrombosis; (b) the prevention of the formation of intracardiac thrombosis, thereby disallowing the genesis of a source of emboli; (c) the prevention of a second coronary thrombosis with additional myocardial infarction during the healing stage; and (d) the prevention of thrombo-embolic phenomena occurring as a result of the coronary thrombosis or coincidental with it during the immediate convalescence.

Initially there was some hesitancy to use anticoagulants because of possible deleterious effect in cases in which the closure of the coronary artery was precipitated by subintimal hemorrhage into an atheromatous plaque. However, English and Willius (36) in their study showed that this type of coronary occlusion played a major role in very few cases.

Wright (42) has stated that the use of dicumarol in this condition is physiologically sound. Beattie and his coworkers (6) recently have shown in work with dogs that dicumarol causes no gross or histological difference in the size or shape of the area of infarction as compared with controls. Blumgart et al. (8) state that there is

no difference in the healing or reparative processes in the hearts of the dicumarolized and control animals. These authors agree that hemorrhage into the area of infarction is not prominent.

In acute coronary thrombosis, death is due primarily to cardiac failure with or without shock, abnormal cardiac rhythms, ventricular rupture, and thrombo-embolic complications. Anticoagulant therapy is directed mainly at the prevention of vascular complications. Certain other theoretical considerations need factual support. Is it logical to assume that anticoagulant therapy will shorten the morbidity? Will the healing time of the area of infarction be decreased? Can it be assumed that angina pectoris following myocardial infarction will be less frequent or severe when treated with anticoagulants? In an effort to clarify these problems and to add to the growing fund of information concerning the clinical use of heparin and dicumarol, the investigation to be discussed in this article was undertaken.

CASE MATERIAL AND METHODS

This series includes 73 patients, 43 of whom were used as a control group and 30 who were given anticoagulant therapy. In each patient the diagnosis of acute coronary thrombosis was established by clinical, electrocardiographic, and laboratory methods. Every case exhibited an electrocardiographic pattern indicative of recent myocardial infarction. All were admitted to the cardiology service of the U. S. Naval Hospital, Long Beach, Calif., during the period of June 1947 to April 1948, all were males and were either Veterans' Administration patients or active or retired naval personnel. With the exception of 3 cases, each patient in this study was under the direct daily supervision and care of the authors throughout the period of hospitalization.

Early in the study a few of the first cases were given both heparin and dicumarol by the method reported by Glueck et al. (21). Thereafter, heparin was used only in those patients in the control group who developed vascular complications. Dicumarol was the only anticoagulant used in almost all the treated cases.

Two methods of treatment were used. The controls were given the generally accepted therapy for acute coronary thrombosis, such as absolute bed rest, oxygen, opiates, vasodilators, proper diet, digitalis, and quinidine. Patients in the experimental group were given exactly the same treatment with the addition of dicumarol therapy. Hereafter the control group shall be designated as "routine" or "control" cases, and the second group as "treated" or "dicumarolized" cases.

Case selection was made for this study in an effort to make the final statistics concerning the use of dicumarol more accurate. The selective criteria were: (a) Any patient dying within 36 hours after admis-

sion was omitted from the study; (b) any patient in whom the onset of symptoms dated the acute episode as occurring more than 4 days prior to admission and who had received reasonably good medical treatment during that period, was not treated with dicumarol; (c) any patient in whom the diagnosis was not unquestionably established by the fourth hospital day, and who ultimately was proved to have had an acute coronary thrombosis with myocardial infarction was treated in a routine manner; and (d) patients who gave clinical or laboratory evidence of the accepted contraindications to anticoagulant drugs were treated as routine cases. Two such cases were seen, one with severe renal damage and the other with a history of a recent cerebral thrombosis.

As stated by Barker (4) the contraindications to dicumarol therapy are: (a) definite renal insufficiency; (b) definite hepatic insufficiency; (c) hepatogenous jaundice, if the prothrombin is deficient; (d) sub-acute bacterial endocarditis; (e) purpura or hemorrhagic tendency; and (f) recent brain or spinal cord injury or hemorrhage. He advises the cautious use of anticoagulants in such conditions as easily bleeding lesions, vomiting with intestinal obstruction, continuous or repeated gastro-intestinal drainage, and dietary deficiency. An adequate clinical history, general physical examination, routine urinalysis, and a prothrombin time will screen the vast majority of patients in whom anticoagulants should not be used.

It is known that a satisfactory increase in the prothrombin time cannot be achieved until 36 to 48 hours after the initiation of dicumarol therapy; therefore, any death prior to this time could hardly have been prevented by dicumarol or attributed to the dicumarol. On the other hand, if these deaths were included in the routine cases the mortality rate of this group would be increased and the resultant impression inaccurate.

The literature indicates that vascular complications rarely occur prior to the fourth day, and are most frequent between the fourth and fourteenth days (10) (32) (37). For the purposes of this series, if for any reason a therapeutic level of the prothrombin time could not be achieved before the fifth day, the patient was relegated to the routine group. In this type of case a lesion, such as a mural thrombus, which might have developed by the fifth day, would preclude the proper evaluation of the preventive action of dicumarol on the ensuing vascular complications. For this same reason, if the diagnosis remained in doubt for longer than the fourth hospital day or if the patient was not seen before the fourth day after myocardial infarction, dicumoral treatment was not instituted and the patient was treated in the routine manner.

In the case of the dicumarolized patient, as soon as the diagnosis was established, an initial, "baseline" prothrombin time was deter-

mined. The Quick (40) method of determination of the prothrombin time was employed. It is not the purpose of this article to enter into the controversy over the efficacy of the various methods of determination of the prothrombin time. The literature on this subject is extensive and no final agreement has been reached. The several variables in the performance of the prothrombin determination, such as the source of the thromboplastin, dilution of the plasma, and concentration of the chloride solution, have produced a disparity of results between the different methods advocated by various authors (9) (11) (25).

Commercial rabbit brain emulsion was the source of thromboplastin. The method used was as follows: Blood was drawn from the patient and exactly 4½ cc. placed in a tube containing one-half cc. of 1/10M ammonium oxalate. This was centrifuged and one-tenth cc. of undiluted plasma was pipetted off and added to one-tenth cc. of thromboplastin solution. The mixture was incubated in a water-bath at 37° C. for 5 minutes. One-tenth cubic centimeter of 1/40M calcium chloride was added and the time for coagulation to occur was recorded with a stop watch. The result in seconds was compared to the standard control and a percent of normal prothrombin time was calculated, using the formula of Quick's curve. (See fig. 1.) The thromboplastin was prepared anew every other day and a standard determination made on each new mixture.

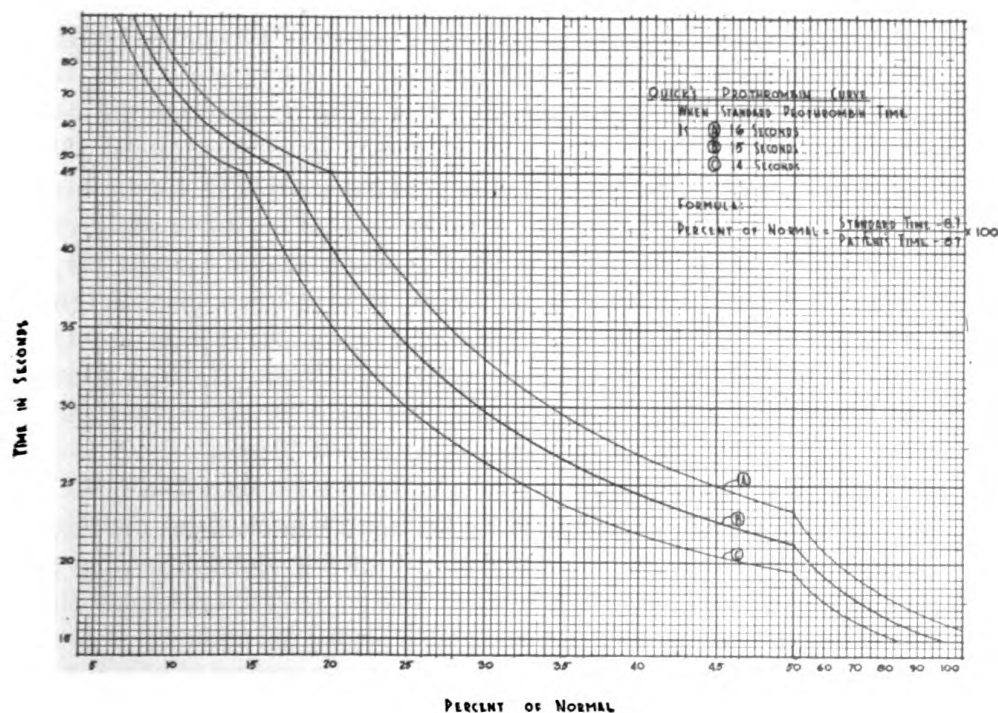


Figure 1.

Simultaneously with the initial prothrombin time determination, the patient was given 300 mg. of dicumarol. Thereafter, daily prothrombin times were performed, and the dicumarol given by the dosage shown in table 1.

TABLE 1

Prothrombin time:	Mg. dicumarol
85 to 100 percent.....	250
70 to 84 percent.....	200
50 to 69 percent.....	150
40 to 49 percent.....	100
25 to 39 percent.....	50
0 to 24 percent.....	0

An effort was made to keep the prothrombin concentration in the individual patient between 15 percent and 30 percent of normal. The average prothrombin concentration for the entire series of treated cases was 18.98 percent of normal. This range of prothrombin deficiency approximates closely the therapeutic levels advocated by Nichol (33) and Hurn, Barker, and Magath (25). The latter group indicated that thrombosis is unlikely to occur if the prothrombin time is kept below 30 percent of normal; that a prothrombin time of 20 percent of normal serves as a guide to dicumarol dosage; and that if the prothrombin time is kept above 10 percent of normal, bleeding is unlikely to occur. Brambel (9) proposes a therapeutic range of 35 percent to 50 percent of normal. However, the optimal range for prothrombin activity with the clinical use of dicumarol in acute coronary thrombosis has not been determined as yet. Whether keeping the prothrombin time within a particular range will alter the statistics significantly requires further investigation.

By the above dosage schedule we were able to control the prothrombin concentration at this relatively low level very well. The authors believe that by dividing the dose of dicumarol in this manner a fairly constant blood level of dicumarol can be maintained, giving a smoother depression of prothrombin production than when larger doses are used more infrequently. Also, this scheme gives a good margin of safety in case a single inaccurate laboratory determination of the prothrombin time is inadvertently obtained. It was found, however, that the schedule was not infallible and a small percentage of patients did not obtain a satisfactory therapeutic level.

When heparin was used, 300 mg. of the drug was placed in 1,000 cc. of 5 percent dextrose in water and the intravenous flow regulated to 20 drops per minute. The coagulation time was determined by the capillary tube method every 4 hours. When the coagulation time reached 18 to 24 minutes, adequate anticoagulant activity was assumed to exist. The flow was then regulated to maintain the coagulation time in this range (21).

RESULTS AND DISCUSSION

The average age of our patients in the control group was 53.3 years, ranging from 32 to 75 years. In the treated series the average age was 51.0 years, the range being from 31 to 70 years. This is a slightly lower average age than would be experienced in patients derived from the general population. The vast majority of our cases in both groups were veterans of the First World War, and therefore a select group in respect to age. Almost all of the patients were members of the white race.

The etiological factor of preexisting hyperpiesis was present in about 45 percent of our patients. This figure compares well with the reports of other investigators and is about the average percentage of those reported in the literature surveyed (21) (30) (31) (32). Forty-nine percent of the patients in the routine group exhibited cardiac enlargement, while 70 percent of the dicumarolized group had this finding. Fifty percent of the patients in both groups knew, or there were hospital records to indicate, that they had some form of heart disease for varying periods of time antecedent to the acute coronary thrombosis.

In the control series about one out of every five patients (18.6 percent) had had at least one previous coronary thrombosis. The corresponding figures for the treated series are one out of three (30 percent). As indicated by history, more than one-half of all patients in both groups had typical angina pectoris. In the treated group the average duration of angina pectoris was 4 years, while in the control group it was 2½ years. The results of Mintz and Katz (31) indicated that "preexisting angina pectoris had little, if any, effect on the prognosis of recent myocardial infarction."

The analysis of the number of patients who were taking digitalis before their attack, or who subsequently required it during their hospitalization or within 3 months thereafter, was made because of the part digitalis might play in the immediate convalescence.

The tendency of digitalis to increase both the coagulability of the blood and the number of thrombo-embolic complications has been reported (2) (16) (31) (37). Also, the amount of digitalis therapy for congestive heart failure would be a fair index to determine whether the use of dicumarol caused a greater amount of functional impairment than when routine treatment was used. In our study the percentage of patients exhibiting a degree of heart failure necessitating digitalis either during or within 3 months following their hospitalization is identical, i. e., 43.9 percent for the routine group and 43.0 percent for the treated group. These figures imply that dicumarol does not adversely affect the cardiac function during or immediately after the healing stage.

TABLE 2

Authors.....	Carmichael & Oetting		Glueck et al.		Nay & Barnes		Parker & Barker		Peters et al.		Wright	Nichol & Page
	Controls 43	Treated 30	Controls 25	Treated 25	Controls 100	Treated 50	Controls 60	Treated 50	Controls 60	Treated 50		
Types of cases.....												
Number of cases.....												
Age.....	53.3 yr.	51.0 yr.	58.6	56.6	58.8	59.0						
Race.....												
White.....	97.7%	96.7%	84.0%	88.0%								
Negro.....	2.3	3.3	16.0	12.0								
Mexican.....												
Previous hypertension.....	44.0	46.6	44.0	60.0	42.0	40.0%						36.0%
Cardiac enlargement.....	49.0	70.0	41.0	48.0								40.0
Previous heart disease.....	51.0	50.0	44.0	44.0	43.0							
Previous coronary thrombosis.....	18.6	30.0	28.0	16.0	12.0	22.0						40.0
Previous angina pectoris.....	56.0	53.3				58.0						
Position of infarct.....												
Anterior.....	63.6	50.0			52.0							
Posterior.....	29.9	43.3			41.0							
Septal.....	2.2	0.0			0.0							
Not localized.....	4.5	6.7			7.0							
Associated diseases.....	32.5	30.0		20.0	13.0							
Shock.....	23.0	33.3	12.0	12.0								26.0

TABLE 3

Authors.....	Carmichael & Oetting		Glueck et al.		Nay & Barnes		Parker & Barker		Peters et al.		Wright	Nichol & Page
	Controls 43	Treated 30	Controls 25	Treated 25	Controls 100	Treated 50	Controls 60	Treated 50	Controls 60	Treated 50		
Types of cases.....												
Number of cases.....												
Degree and duration of pain.....	2.4	2.1										
Thrombo-embolic complications.....	28.0%	6.7%		4.0%	37.0%	4.0%						2.0%
Digitalized patients developing thrombo-embolic complications.....	58.3	0.0	24.0%				16.6%		2.0%			
Duration of absolute bed rest.....	34.8 d.	30.0 d.										
Duration of hospitalization.....	42.4 d.	32.6 d.										
Deaths.....	16.3%	13.3%	32.0%	12.0%	13.0%	10.0%	21.7%	4.0%			19.7%	12.5%

It is of interest to note that in the control group more than one-half of the patients who received digitalis (58.3 percent) developed thrombo-embolic complications during their course. In none of these patients were there any serious cardiac arrhythmias. Askey and Neurath (2) reported an increased number of peripheral emboli and an elevated mortality rate when digitalis was used in cases of myocardial infarction who developed congestive heart failure and auricular fibrillation. Peters (37) stated that digitalization for congestive heart failure in coronary thrombosis increases the incidence of thrombo-embolic phenomena.

Of the six dicumarolized patients who received digitalis, none suffered vascular complications. Dicumarol may have the ability to antagonize the increased tendency toward vascular complications produced by digitalis therapy. It would seem safer, therefore, to use digitalis when the patient is dicumarolized.

Localization of the area of infarction by electrocardiographic means revealed the ratio between the anterior and posterior infarctions to be about 2:1 in the routine group, and about 1:1 in the treated group. In two cases (6.7 percent) of the treated series, localization was impossible. As indicated by Woods and Barnes (41) the mortality rate in such patients is very high, approximately 80 percent. Both of our cases, however, survived without complications.

In 32.5 percent of the controls one or more associated diseases were present, while this was true in 30 percent of the treated group. None of these diseases, with the possible exception of two cases of diabetes mellitus in each group, had direct causative significance in the acute coronary thrombosis. Among the associated diseases encountered were: old cerebrovascular accidents, pneumonia, acute and chronic alcoholism, diabetes mellitus, peptic ulcer, pulmonary infarction, bronchial asthma, bronchiectasis, syphilis, cirrhosis of the liver, and chronic nephritis.

Some degree of shock was present in 23 percent of the control group and 33 percent of the treated group. This includes all degrees of the shock syndrome from those exhibiting the mildest of symptoms to those in profound collapse.

An attempt was made to determine whether or not dicumarol would affect the degree of pain in acute coronary thrombosis. In both groups sufficient opiates were ordered to keep the patients comfortable. Because of the variable individual reaction to pain the evaluation of this factor proved very difficult. Glueck and her coworkers (21) reported that the pain factor seemed less in cases treated with heparin, indicating that this may have been due to the fact that the control group was not given injections simulating the heparin. In this series the maximum duration of pain requiring the use of opiates was graded as

4 plus. On this basis, the figure for the control group was 2.4 plus and the treated cases 2.1 plus. These figures seem to indicate that there is very little if any difference in the duration of pain when dicumarol alone is used.

Our experience in the prevention of vascular complications with the use of dicumarol parallels the results reported by other authors (21) (33) (34) (36) (37) (42). Thrombo-embolic phenomena have been reported by Glueck et al. (21) as 24 percent in their control group, by Peters et al. (37) as 16 percent in their controls, and by Nay and Barnes (32) as 37 percent. Hellerstein and Martin (23) reported an incidence of 11.5 percent in 1,605 clinical cases. The term "thrombo-embolic" includes pulmonary infarction caused by pulmonary thrombosis or embolism, secondary myocardial infarction caused by a second coronary thrombosis or propagation of the original clot, cerebral thrombosis and embolism, thrombophlebitis and phlebo-thrombosis, and peripheral arterial occlusion. Pure embolism has been reported as occurring in 20 percent of cases by Bean (5), 14 percent by Blumer (7), 18.9 percent by Master et al. (29), and 31 percent by Eppinger and Kennedy (17) working with autopsy material. Pulmonary embolism alone, as given by Nichol (34) in his review of the literature, ranges from 3 to 42 percent. The higher figure was derived from autopsy findings. This high incidence of vascular complications in acute coronary thrombosis and the attending higher mortality makes this problem of extreme importance.

In our series, the control group suffered an incidence of 27.9 percent (12 cases) of clinical thrombo-embolic phenomena. In the dicumarolized patients only 6.7 percent (2 cases) suffered vascular complications. In one of the treated patients a secondary myocardial infarction occurred, while in the second case a renal infarction developed. In the routine group there were 8 incidences (18.6 percent) of secondary myocardial infarction, 4 incidences (9.3 percent) of pulmonary infarction, 3 incidences (6.9 percent) of thrombophlebitis, and 1 incidence (2.3 percent) of mesenteric thrombosis. Dicumarol apparently reduced the number of thrombo-embolic complications to one-fourth of the expected number.

The patients in the routine group were kept at absolute bed rest for an average duration of 34.8 days, and in the hospital for 6 weeks. This may be compared to a period of strict bed rest of 30.0 days and a hospitalization period of just over 5 weeks in the dicumarolized patients. In all cases, those having an uncomplicated recovery were kept at absolute bed rest at least 25 days. This duration of bed rest is perhaps a little shorter than has been generally accepted as necessary in years past. Harrison (22) reported that animals in which myocardial infarction was experimentally produced and which were kept

at prolonged rest, had a less satisfactory course than those in which activity was allowed twice a day. He stated that recumbency should not be prescribed for more than 2 or 3 weeks after the more acute and alarming symptoms have subsided. Levine (27) (28) also points to some of the evils of restricted activity in cardiovascular diseases. The present trend seems to be toward less emphasis on prolonged absolute bed rest in cardiac disease and in cases having an entirely uneventful convalescence, minimal activity was allowed after the twenty-fifth day. The disparity between the length of restricted activity and the stated average durations of bed rest and hospitalization is due to the delayed recovery resulting in those patients who developed complications. The apparent decrease in the morbidity of the dicumarolized patients is directly due to a lower incidence of thrombo-embolic complications than occurred in the control group.

As reported by Nichol (34) in his review of the literature the immediate mortality in acute myocardial infarction ranged from 9 to 53 percent. The period "immediate" includes the initial 4 to 8 weeks after the acute episode. These figures, when averaged, give a mean mortality of 24.75 percent in 2,623 cases.

In the control series we had a mortality of 16.3 percent (seven cases). This may be compared to a mortality rate of 13.3 percent (four cases) in the dicumarolized patients. Of the seven patients in the routine group who died, two (28.5 percent) had thrombo-embolic complications which were important factors in the cause of death. Of the four patients in the treated group who died, none had vascular complications.

Wright (42) reported in his complicated group, i. e., patients who suffered thrombo-embolic phenomena, an expected mortality of 60 to 70 percent. Hellerstein and Martin (23) reported that "in 43 of 160 cases it is certain that thrombo-embolic lesions were important as a cause of death." Mintz and Katz (31) report a mortality of 55.8 percent in their cases who suffered thrombo-embolic phenomena. However, there seems to be a paucity of data giving the prognosis in this special category of patients not treated with anticoagulants.

Death in the control group occurred after an average of 37.0 days. One patient, who finally succumbed, remained in the hospital 166 days because of vascular complications. Omitting this patient from the calculation, death in the other six patients occurred after an average of 15.8 days. This closely approximates the average number of days before death in our treated group which was 13.0 days after the acute episode. It is interesting to note that in the control series six of the seven deaths, and in the treated group all (four) deaths were due to heart failure. This would seem to indicate that in the immediate convalescence, death from acute or chronic heart failure is most

none to occur within the first 2 weeks. Master, Dack, and Jaffe (29) also have recorded this observation.

In our control group the principal cause of death was acute cardiac failure in three cases (42.8 percent), chronic cardiac failure in three cases (42.8 percent), and cardiac tamponade in one case (14.2 percent). In the dicumarolized patients, all four fatalities were due to acute cardiac failure, three of whom probably developed ventricular fibrillation following intermittent attacks of ventricular tachycardia.

As Master, Dack, and Jaffe (29) and Peters et al (37) have pointed out, the largest single cause of death is severe heart failure with or without shock. Mintz and Katz (31) reported that in men 42.6 percent of those exhibiting congestive failure died. In our control group 6 of the 12 (50 percent) patients who exhibited congestive failure died, while among the dicumarolized patients 1 out of 6 cases (16.7 percent) died.

Allan, Barker, and Waugh (1) have stated that the only danger in dicumarol therapy is hemorrhage. Mild diarrhea, occasional nausea and vomiting, and headache have been reported by Kossove (26) and Peters et al. (37). In this series the latter symptoms were not seen. The only influence noted on the laboratory control of the patient was the apparent inaccuracy of the sedimentation rate in those cases receiving dicumarol. As a result, this test was discarded in the treated cases.

In the control group there were two patients (4.6 percent) in whom a hemorrhage occurred during recovery. Neither of these sanguinary episodes was serious, as both were instances of minimal rectal bleeding. One of these patients subsequently died, but it was not felt that the hemorrhage was a contributory cause. In the dicumarolized patients hemorrhage of all types and degrees of severity occurred in five (16.6 percent). Four of these patients had bleeding of a mild type; two had epistaxis, and two noted some oozing from the gums. One patient suffered a gastro-intestinal hemorrhage and was treated with large amounts of parenteral vitamin K, and transfusion with fresh citrated blood, as recommended by Falk and others (13) (18) (19) (38). The prothrombin level quickly returned to normal limits. This patient eventually died in ventricular fibrillation.

Glueck et al. (21) reported an incidence of 12 percent hemorrhage in dicumarolized patients, although none of these was serious. Parker and Barker (36) and Peters et al. (37) reported no cases of serious hemorrhage in their total of 100 cases. Nichol and Page (33) have stated: "In spite of the occasional fatal hemorrhage incurred by dicumarol, it is as safe as many other effective drugs in common use * * *" Barker (3) also points out that the seriousness of dicumarol induced bleeding has been overemphasized. The authors concur in these opinions.

In dicumarolized patients, the initial dose of dicumarol was 300 mg. and subsequent dosage was determined by daily prothrombin times. It was considered a prothrombin concentration of 30 percent of normal a sufficient therapeutic level, and calculated the percentage of patients who obtained this level in a given period of time. The results are indicated in table 4.

TABLE 4	
Hours after first dose:	Percent with therapeutic level
12	14.3
36	53.6
60	64.3
84	96.4

In all cases except one the desired therapeutic range was reached within $3\frac{1}{2}$ days. These figures would indicate that the individual reaction to dicumarol is indeed quite variable and that perhaps higher doses of the drug are indicated in the first 24 hours, to produce more rapidly a therapeutic level of prothrombin deficiency. Clinically, however, in the day-by-day administration of dicumarol we found a fairly constant depression of the prothrombin concentration with a given amount of the drug, in the individual patient.

The patients were given dicumarol for an average of 25.5 days, with the range among the survivors being 13 to 34 days. Numerous authors have reported the increased clotting tendency in a majority of patients who have suffered coronary thrombosis (9) (14) (15) (24) (37) (42). Ogura et al. (35) in studying this finding determined that in the great majority of cases the blood returned to its normal coagulability within 21 days following the attack. This may be the measure of the duration of dicumarol therapy and which Glueck et al. (21) followed in their cases. Nay and Barnes (32) reported over 85 percent of thrombo-embolic complications occurring between the fourth and twentieth days, with the exception of clinical pulmonary emboli, 93 percent of which occurred between the sixteenth and thirty-sixth days. The exact duration of dicumarol therapy in acute coronary thrombosis requires more investigation.

Although the increased clotting tendency, occurring in many patients either concomitantly or following their attack of coronary thrombosis, seems fairly well established, there is no evidence that these are the only patients who suffer vascular complications. As yet there is no means by which to recognize which patient is going to suffer a thrombo-embolic episode.

SUMMARY AND CONCLUSIONS

1. Seventy-three cases of acute coronary thrombosis are discussed. Forty-three patients were given the routine, accepted treatment for this condition, while 30 were given dicumarol therapy. A comparison of the two types of treatment was made.

2. A dosage schedule is presented which the authors believe to be an improvement over most plans of administering dicumarol in this condition.

3. In the control series 43.9 percent of the patients required digitalis either during or shortly after their hospitalization. In the dicumarolized group 43.0 percent required digitalis. Dicumarol apparently does not adversely effect the cardiac function during or immediately after the healing stage.

4. Fifty percent of the control patients who received digitalis developed thrombo-embolic complications, while none of the dicumarolized patients receiving digitalis suffered vascular complications. This seems to indicate that digitalis is given with more safety to the patient under adequate anticoagulant control.

5. The administration of dicumarol had no effect on the degree or duration of pain occurring with acute coronary thrombosis.

6. In the control series there was an incidence of 27.9 percent of thrombo-embolic phenomena, while among the patients receiving dicumarol only 6.7 percent developed vascular complications. Dicumarol therapy significantly reduced to less than one-fourth the number of thrombo-embolic complications.

7. The average period of strict bed rest was reduced 4.8 days and the average period of hospitalization 7 days by the preventive action of dicumarol on complicating thrombo-embolic phenomena.

8. The mortality rate of our control group was 16.3 percent, while that of the treated series was 13.3 percent. We believe that if the incidence of cardiac enlargement, multiple attacks of coronary thromboses, and shock had not been slightly greater in our dicumarolized group, the mortality rate for this group would have been lower.

9. Serious hemorrhage with dicumarol therapy is an uncommon event.

10. Within 36 hours after the initiation of dicumarol therapy, 53.6 percent of the patients had a prothrombin concentration of 30.0 percent of normal or below. This suggests that perhaps larger doses of dicumarol during the initial 48 hours may be indicated in an effort to obtain a higher percentage of satisfactory levels during the primary stages of treatment.

11. As the use of quinidine has been found to be of value in the treatment of cardiac arrhythmias occurring in myocardial infarction the fear of dislodging a portion of mural thrombus is largely quelled by an adequate anticoagulant level. In the latter event a large mural thrombus may be reasonably assumed to be absent.

12. In view of the apparent efficacy of dicumarol in the treatment of myocardial infarction it would seem just to give all patients having this condition, and otherwise suited, anticoagulant therapy as part of an active therapeutic regimen.

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THE MANAGEMENT OF DIABETES MELLITUS

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SINCE insulin came into common use, the problem of vascular disease in diabetes has become paramount. Even before the discovery of insulin Dr. Frederick M. Allen (1) observed that in order to insure complications in the diabetic patient, all that is necessary is to keep the patient alive and give him half-way treatment. Today an increasing number of medical publications reveal the prevalence of serious vascular complications in patients whose years of life have been extended by the use of insulin (2). Lengthening the life of the diabetic patient brings with it the medical problems associated with senescence plus the complications of diabetes, such as inter-capillary glomerular sclerosis and diabetic retinitis. The average age at death of the diabetic patient today is almost 20 years greater than in the Allen era, 1914 to 1922 (3). There is a considerable difference between keeping patients alive with insulin and treating diabetes. Insulin serves to keep patients alive, while we must depend upon dietary regulations for the best treatment of diabetes.

OBJECTS OF TREATMENT IN DIABETES

To effectively instruct and treat diabetic patients, the physician should keep in mind the valuable experimental work in diabetes done by competent observers during the past 25 years, as well as the vast

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array of clinical data all of which are more than convincing. Following the discovery of insulin, the recommended dietaries were numerous and various: high fat diets (4), high calorie diets, high carbohydrate diets (5), and others. Experience and more mature judgment have served to bring about uniform agreement as to management. The greater our experience, the more we are convinced that the metabolism of the patient with diabetes varies little from the normal individual, except for his inability to utilize a normal diet.

In the minds of most persons diabetes and sugar or carbohydrate metabolism are inseparable. In reality, sugar and carbohydrates are no more specific of diabetes than fat or protein. Diabetes is best defined as a metabolic condition in which the body is unable to utilize a normal amount of food. Food is measured in calories. The calories derived from carbohydrates are not different from those derived from fat or protein. Allen in 1916 (6) was the first to show that total calories regulate diabetes and that irrespective of the kind of food, or calories, overnutrition activates diabetes; and undernutrition, or lowering of the total calories, causes diabetes to become inactive. All other evidence to the contrary, we have but to review the disastrous results which are recorded in any era. The Van Norden era is a good example. During that regimen of high-fat, low-carbohydrate diets, high-calorie diets, diabetic complications, such as gangrene, retinitis, and coma, were early and all too frequent; the mild diabetes was intensified and the potential diabetes was aggravated and soon showed signs of active diabetes. There is sufficient clinical evidence to show that high-fat, low-carbohydrate diets are effective in producing early arteriosclerosis in the nondiabetic person. Hence, in the Van Norden era many of the vascular complications of diabetes were initiated and augmented by the prescribed high-calorie diets, more so than by the diabetes.

The principal object in the treatment of diabetes is to so regulate the diet and insulin as to enable the patient to fully utilize his total caloric intake. The writers are not in accord with the teachings of a small group who have expressed the opinion that hyperglycemia and glycosuria are harmless and need not be controlled (7). The treatment which they propound is exactly no treatment at all. Fortunately, this doctrine has now practically fallen by the wayside, but for a time it interfered with better and more careful management. Certainly hyperglycemia is painless and glycosuria can only cause polyuria and local skin lesions, but diabetes has a more profound nature than these two rather minor manifestations. Mere maintenance of life is not the goal sought and responsibility does not end there. Hyperglycemia is nonphysiologic and it reflects the presence of other improperly metabolized chemical elements in the body.

LAWS GOVERNING DIABETES

There are a few basic laws which pertain to proper control of diabetes. Probably the most important is the relationship of obesity to diabetic activity. As the body weight increases, diabetic activity increases, and conversely as the body weight decreases, diabetes becomes quiescent. When obesity complicates diabetes, body weight should be reduced to a theoretical normal standard weight. Increase in diabetic activity with increase in body weight, particularly in the presence of overnutrition, can quickly and easily be demonstrated in experimental diabetes in dogs, since their life cycle is seven to eight times more rapid than that of man (8). One of the most common misapplications of insulin is its initial use in obese patients with early diabetes. Insulin should not be given to such patients simply to enable them to appease their appetites. In many such instances it may be eliminated by instituting a reasonably low-calorie or maintenance diet. As their body weight falls, food tolerance increases because the pancreas is relieved of overstrain and there results an increase of endogenous insulin. Patients are able to appreciate the simple explanation that as they reduce their weight, they have more available insulin for each pound of body weight. It is a common experience to be able to discontinue insulin simply by reducing the body weight of an obviously obese diabetic person. Body fat requires more insulin per gram or pound than does the more vital and important active muscle protoplasm; this is obvious from the relative caloric values of the two substances.

One law which is easily demonstrated is that diabetes becomes more active when the caloric intake is increased. Insulin requirement increases in a geometric ratio with a corresponding increase in diet. With excessively high-caloric diets the insulin requirement may be inordinate. The reason some of the so-called insulin-resistant patients cannot be controlled may be due to excessively high-calorie diets rather than to actual insulin resistance. There is a growing belief among many competent clinicians that approximately 40 units of insulin is adequate to control the disease. If the requirement is greater, the offending factor is probably obesity or the diet is unnecessarily high in food value. This would serve to give credence to the theory that all diabetes is the same and that so-called severe diabetes is explainable on complicating factors such as prolonged, uncontrolled diabetes or excessive food intake.

The longer the disease is permitted to continue uncontrolled, the greater is the insulin requirement and the more rigid the diet restrictions required for subsequent control. Even in extreme instances, tolerance can be restored by a period of persistent control with reduced

diet and frequent insulin administration. Often the result is gratifying to both patient and physician.

METHODS OF INSULIN ADMINISTRATION

At the U. S. Naval Hospital, San Diego, Calif., the writers have remained flexible as to judgment or application of any procedure and have required that the type or types of insulin and the dosage prove adequate for the control of each individual patient. They are not convinced that there is any one particular or ideal method for all patients. Security of control has not been sacrificed for simplicity of method.

In the majority of instances, the writers have used both regular crystalline insulin and protamine-zinc insulin in separate doses one-half hour before breakfast. This is the most satisfactory method in chronic or severe diabetes. A large number of patients entered the hospital in an uncontrolled state because of a common failing; their belief that they should see how little insulin they should use to avert glycosuria rather than an optimal amount consistent with their requirements. This only leads to increasing the activity of diabetes and consequently larger amounts of insulin are required later. On the other hand, we have obtained better control when we insist upon adequate dosage. Insulin reactions are to be avoided. When diabetes is adequately controlled, there is less progression of the disease, so that in a given period the average dose remains uniform. In the poorly controlled patients the total amount of insulin required in similar periods will be the same because of the periodic additional doses required. Our choice between regular and protamine-zinc insulin in advanced diabetes is based on the known physiological activity of the two insulins. The regular quick-acting insulin serves to metabolize the morning meal. When the peak of its activity has subsided, by mid-morning, the activity of the protamine-zinc insulin is then under way and serves its purpose for the rest of the 24-hour period. Attempts to control severe diabetes solely with protamine insulin have proved disastrous in view of the profound reactions during the night. One must keep in mind the possibility of permanent cerebral injury which may follow prolonged periods of hypoglycemia (9) (10).

A few patients with early diabetes and patients in evident states of under-nutrition can be controlled simply with one dose of protamine insulin given before breakfast. The real test of insulin lies in its effect in severe diabetes, since mild diabetes can be controlled with little or no insulin.

Insulin mixtures also have been used successfully. Colwell (11) and Peck (12) have published a number of valuable articles based upon a vast amount of work which they carried out using mixtures of

various types and amounts. When crystalline insulin and protamine-zinc insulin are mixed, the action is more prompt and less prolonged than one injection of protamine-zinc insulin. No mixture has been devised which is as satisfactory as when either insulin is given separately. However, a mixture of two parts of crystalline insulin and one part of protamine-zinc insulin seems to be the optimal one. Patients find it difficult to mix the two insulins in the syringe before injection. One simple method is to mix a supply in an empty insulin bottle and simply draw out the daily allotment as required. The mixture is apparently stable, although the *pH* of the two insulins is altered. A common mistake observed is the prescription of a mixture of two parts of protamine-zinc insulin and one part of regular insulin. Protamine-zinc insulin contains an excess of protamine and each unit will combine with one unit of regular insulin to form two units of protamine-zinc insulin.

RETINAL AND OCULAR COMPLICATIONS IN DIABETES

Twenty-five years of treatment of diabetes with insulin have brought about the realization that insulin does not assure freedom from diabetic complications, particularly ocular. In patients whose diabetes began in early life, the frequency of partial or complete loss of vision after a 15- to 20-year period is appalling. The present cheerful and encouraging outlook for the patient was initiated with the discovery of insulin.

Dolger (13) reports 200 patients with diabetes of 25 years' duration all of whom showed retinal hemorrhages regardless of age of onset, severity of diabetes, or the type of treatment used; also the retinopathy usually presaged progressive vascular degeneration and 50 percent of the patients presented hypertension and albuminuria. This is a severe indictment, not only of our present-day treatment of diabetes, but also of insulin itself. It would indicate that insulin lacks a great deal in supplying all the missing chemical elements necessary to control diabetes. We must also consider vascular degeneration as an inherent and inseparable component of diabetes rather than a complication which can be avoided. Fortunately, this is not the universal experience; however, high incidence of retinal degenerative changes under any form of therapy is a common experience.

The increase in the number of reports of severe retinal complications in long-standing diabetes although discouraging is not a cause for abandonment of the accepted treatment of diabetes but calls for more rigid control and close investigation of the type of treatment prescribed for those who show devastating retinal lesions. To simply report that the patient received insulin and was on a prescribed diet does not suffice. It is clearly evident that retinal lesions can be made

quiescent when the diabetes is controlled by restricting the total calories in the diet and administering adequate insulin. Fulminating retinitis in adults or premature retinitis and blindness in juveniles is an early occurrence when diets are not restricted and insulin is haphazardly administered. Proper treatment not only arrests the progress of retinitis, but is ameliorative. The reports of Lawrence (14), Graham (15), and a host of other competent authorities confirm this.

Up to the present, neither arteriosclerosis nor any specific factor or substances except uncontrolled diabetes has been proved to be the cause of retinitis in diabetes. Retinitis occurs oftener in some diabetics than in others and the lesions in some are more rapidly progressive. This must be due to hereditary and inherent factors which are not understood. Some authorities have expressed the opinion that retinal hemorrhages are attributable to an increased capillary fragility and a weakening of the resistance of the capillary walls. Foxworthy (16) studied a large group of diabetic patients without hypertension, using the positive pressure method of capillary fragility. In a group of 85 nondiabetic persons of varying ages, the average time, after application of the blood pressure cuff, for the appearance of the first petechiae was 4.9 minutes; and after the cuff had been in place 10 minutes, the average number of petechiae appearing in a circle the size of a 25-cent piece was 14. Among 69 diabetic persons without retinopathy, the average time for appearance of the first petechiae was 2.36 minutes, and the average number of petechiae in 10 minutes was 41. Among 44 diabetics with retinopathy the average time for the appearance of the first petechiae was 1.5 minutes and the average number of petechiae in 10 minutes was 101. In only 1 of the 44 who had retinopathy was the time for the appearance of the first petechiae greater than 4 minutes, and in only 4 was the number of petechiae in 10 minutes less than 25. These findings would seem to indicate that capillary fragility is definitely increased in almost all patients with diabetes who have retinopathy.

There are differences of opinion as to whether diabetes produces a specific pathological retinal picture as contrasted with hypertensive, arteriosclerosis, or renal disease. The primary stage of progressive diabetic retinopathy is assumed to occur in the veins, while in the other instances it is in the arteries. Enlargement and beading of the veins in cases of diabetes were demonstrated by Nettleship (17) as long ago as 1888. Bedell (18) has been especially impressed with the frequency of distention of the retinal veins with beading, tortuosity, and thrombosis. Deep retinal hemorrhage and waxy exudates often mark the primary stage. Gifford et al. (19) state that there is no one ophthalmoscopic sign which permits the diagnosis of diabetic retino-

pathy with certainty. However, he believes that hemorrhages are somewhat characteristic, and that there are certain macular and paramacular changes which are often suggestive. O'Brien and Allen (20) frequently noted varicosities of the larger retinal veins without particular relationship to the arteriovenous crossings. Ballantyne (21) described the very early lesions of diabetic retinopathy as a clear-cut and specific entity entirely apart from hypertension or arteriosclerosis. In the ophthalmoscopic picture the earliest findings are minute, globular micro-aneurysms of the retinal capillaries, usually found singularly or in small numbers within or near the macular area. These minute aneurysms often give a bright central reflex, and are to be differentiated from punctate hemorrhages. He also emphasizes the diagnostic importance of the over-filling of the retinal veins. Histologic examination of flat and stained sections of the retina show the micro-aneurysms appearing as mulberrylike bodies composed of compact bodies of erythrocytes enclosed in a membrane of varying thickness; in some cases a thin structureless film and in others a wall of some thickness which may have a fibrillary character. The aneurysms are situated in the inner nuclear layer and are globular distentions of the capillaries. The diameter of the micro-aneurysms may be 10 or 15 times that of the parent capillary. Swelling of the endothelium of the capillaries and precapillaries in association with the deposit of fatty granules within their walls as a forerunner of aneurysm formation were also observed. Wagener (22) formerly held the opinion that retinopathy of diabetes and arteriosclerosis were the same, but he now believes it produces characteristic lesions of the retinae.

DIABETIC CLINIC, U. S. NAVAL HOSPITAL, SAN DIEGO, CALIF.

In the fall of 1946 in connection with the beginning of the Residency Training Program, special facilities were established at the U. S. Naval Hospital, San Diego, Calif., for the care, treatment, instruction, and follow-up of diabetic patients. For better administration and ease of dietary control, all diabetic patients, except officers and dependents, were sent to one ward where facilities for doing urinary sugars and micro-blood sugars were available. They were seen weekly by the consultant in diabetes and metabolic diseases, and weekly clinics for the follow-up of dependents and retired personnel with diabetes were established. A weekly period of instruction in the course and nature of diabetes was instituted. The chief dietitian actively collaborated in these periods of instruction. Outpatients as well as active hospital patients have been encouraged to attend the instruction periods. Much of the instruction in food values has been given in the diet kitchen by the chief dietitian and her staff. During the period of

hospitalization each patient was furnished with a copy of Joslin's Diabetic Manual.

TABLE 1.—*Compilation of 190 cases of diabetes mellitus*

[Male, 142; female, 48]

10 years' duration or longer.....	40
Acute onset.....	80
Acute reactivation.....	5
Obesity.....	62
Hypertension.....	61
Retinal arteriosclerosis.....	60
Retinal hemorrhage and exudates.....	60
Hepatomegaly with or without history of alcoholism.....	21
Angina pectoris or coronary insufficiency.....	18
Arthritis.....	16
Incipient or frank cataracts.....	15
Pregnancy.....	11
Gangrene of extremity.....	10
Nephritis.....	10
Coma.....	9
Proven cirrhosis of the liver.....	8
Cutaneous ulcers.....	7
Coronary thrombosis.....	5
Hyperthyroidism.....	4
Xanthoma diabeticorum.....	4
Pulmonary tuberculosis.....	4
Acromegaly.....	1
Charcot joint.....	1
Scleroderma.....	1
Paralysis agitans.....	1
Died in coma.....	1

Family history

Data obtained concerning family history.....	116
Family history positive.....	33

During the period from 1 October 1946 through 30 April 1948, 190 patients with diabetes mellitus have been seen, either as hospital patients or as outpatients. This series of early as well as late cases presented all the numerous complications of diabetes, the most frequent and serious being vascular. Table 1 is a compilation of the various complications showing the high incidence of hypertension, retinal arteriosclerosis with and without hemorrhage and exudates, angina pectoris and coronary insufficiency, liver disease, cataracts, gangrene of an extremity, and nephritis. There were 4 patients with xanthoma diabeticorum, 1 with an associated scleroderma, and 1 of that rare manifestation of diabetic neuropathy—Charcot joint. This unusual case will be reported separately in more detail. There was 1

death in coma of a Portuguese merchant seaman who was flown to this hospital by a Coast Guard rescue plane from a fishing vessel 300 miles off the coast of Lower California. He had been in a coma for 36 hours prior to arrival and died within 12 hours despite adequate treatment. In 116 of the 190 patients in which data concerning a family history were available, there was evidence to indicate a direct hereditary factor in 33.

TABLE 2.—*Clinical cause of death in 15 cases of diabetes mellitus*¹

Age at death	Sex	Duration of diabetes	Principal cause of death	Contributory cause of death
54	M	3 years	Cerebral hemorrhage	Arteriosclerotic and hypertensive heart disease. Arteriosclerosis obliterans. Angina pectoris.
58	M	8 years	Uremia	Transverse myelitis due to thrombosis of spinal artery at level of T8. Chronic nephritis. Bronchopneumonia.
70	M	Unknown	Cerebral hemorrhage	Chronic urinary infection (prostatic hypertrophy).
36	M	5 years	Hepatorenal syndrome	Cirrhosis of the liver. Chronic alcoholism. Bronchopneumonia.
73	M	9 years	Arteriosclerotic heart disease	Chronic osteomyelitis (both tibiae).
54	F	2 years	Hypertensive and arteriosclerotic heart disease	None.
70	F	3 months	Carcinoma of pancreas	Retroperitoneal hemorrhage.
37	F	8 years	Coronary thrombosis with myocardial infarction.	Pulmonary embolism. Chronic nephritis with edema (Kimmelstiel-Wilson disease). Pulmonary tuberculosis. Coronary sclerosis.
61	M	10 years	Arteriosclerotic heart disease with decompensation.	Coronary sclerosis. Gangrene of foot (right).
55	M	1 year	Hypertensive and arteriosclerotic heart disease.	General arteriosclerosis. Abscess right testicle. Xanthoma diabeticorum.
60	M	22 years	Carcinoma of rectum with metastasis to lungs, peritoneum.	Bronchopneumonia. Arteriosclerotic heart disease. Chronic nephritis.
58	F	1 year	Hypertensive and arteriosclerotic heart disease with decompensation.	Pernicious anemia. Bronchopneumonia. Chronic cystitis. Old fracture right femur.
61	M	3 months	Perivesicular abscess (secondary to transurethral resection).	Uremia. Bronchopneumonia. Hypertensive and arteriosclerotic heart disease.
60	F	3 years	Chronic nephritis with edema (Kimmelstiel-Wilson disease).	Arteriosclerotic and hypertensive heart disease. Gangrene foot (left).
31	M	12 years	Diabetic coma	Bronchopneumonia.

¹ Diseases of the cardiovascular system were the principal cause of death of most of the diabetics in this series. There was 1 death from coma. This is in keeping with the rising predominance of arteriosclerosis as a cause of death in diabetes in the past 25 years; arteriosclerosis has increased by 333 percent, while coma has dropped to one-twentieth of its former importance.

There were 15 deaths in this series of 190 patients (table 2). Of this number, 11 came to autopsy (table 3). A study of the clinical cause of death in the first group of 15 patients, as well as a study of the 11 that came to autopsy, brings out the high incidence of vascular, renal, and hepatic complications as well as of infection. Of the renal complications, there were two well-defined instances of intercapillary glomerulosclerosis. Some patients had several renal complications such as pyelonephritis and an associated renal arteriosclerosis or glomerulonephritis. Three showed pyelonephritis, which bears out Millard and Root's contention of the frequency of pyelonephritis in diabetes. The high incidence of associated liver disease, fatty infiltration and cholelithiasis, and cholecystitis, also should be noted.

TABLE 3.—Autopsy findings in 11 cases¹

	Cause of death	
	Principal	Contributory
Vascular:		
Cerebral thrombosis.....		1
Coronary sclerosis.....	2	3
Coronary occlusion without infarction.....		2
Coronary occlusion with myocardial infarction.....	1	
Arteriosclerotic heart disease with decompensation.....	4	1
Pulmonary embolus.....		2
Generalized arteriosclerosis.....		8
Thrombosis peripheral arteries.....		5
Total.....	7	22
Renal:		
Intercapillary glomerulosclerosis.....	1	1
Arteriosclerotic nephritis.....		7
Chronic glomerulonephritis.....		2
Pyelonephritis.....		3
Hydronephrosis.....		2
Total.....	1	15
Infection:		
Perivesicular abscess (post-transurethral resection).....	1	
Osteomyelitis.....		1
Bronchopneumonia.....		5
Pulmonary tuberculosis (active).....		1
Total.....	1	7
Liver:		
Fatty infiltration.....		2
Cholelithiasis.....		3
Cholecystitis.....		3
Total.....	0	8
Pancreatic:		
Carcinoma of pancreas with metastasis.....	1	
Fibrous replacement.....		2
Fat replacement.....		1
Total.....	1	3
Miscellaneous:		
Carcinoma of rectum with metastasis.....	1	
Pituitary hypertrophy.....		1
Polyps stomach.....		1
Hyperstatic bone marrow (pernicious anemia).....		1
Abscess right testicle.....		1
Xanthoma diabeticorum.....		1
Total.....	1	5

¹ The high incidence of vascular complications and renal lesions in diabetes mellitus is shown in this table of 11 autopsies. There were 2 instances of intercapillary glomerulosclerosis and 2 instances of malignancy.

SUMMARY AND CONCLUSIONS

A special metabolic service was established at the United States Naval Hospital, San Diego, Calif., in August 1946; 190 patients were treated in the ensuing 19 months. Diabetes was treated on the assumption that the disease is one of total metabolism and not solely a disease of carbohydrate disturbance. The writers have insisted upon certain standards and requirements, such as normal standard weights, total caloric regulation of the diet, and adequate insulin, to insure as much freedom from hyperglycemia as possible throughout the 24-hour

period. Hyperglycemia is harmful. Data reveal the usual high incidence of vascular disease in diabetes of any appreciable duration. There was only one death from coma.

Retinitis was a complication in 31 percent of the cases. This high percentage is related to the age group of the patients. The high incidence of retinitis in diabetes, brings up the question as to whether it is an inherent part of the disease or whether it is a complication. Uncontrolled diabetes is the principal factor in the production of retinitis. Some diabetic persons develop retinopathies with greater readiness than others, for which there is no explanation other than possible hereditary factors which are not understood.

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**RESIDENCY TRAINING PROGRAM IN NEUROLOGY UNDER THE
VETERANS' ADMINISTRATION**

An additional residency training program for physicians desiring to train in neurology under the Veterans' Administration has been organized by the Philadelphia Deans Committee. This residency covers a period of 3 years or less, depending upon the previous experience of an applicant, and is designed to prepare residents for certification in neurology for the American Board of Psychiatry and Neurology. The program includes rotation through the Veterans' Administration Hospital, Coatesville, Pa., Veterans' Administration Regional Office, Philadelphia, Pa., and the Philadelphia General Hospital. Applications should be sent to the Manager, Veterans' Administration Hospital, Coatesville, Pa.



REITER'S DISEASE, BEHCET'S SYNDROME, AND STEVENS-JOHNSON DISEASE

A Study and Comparison

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WITHIN the past 10 years there have been increasingly frequent reports in the literature of three relatively unusual clinical entities, each presenting a characteristic triad of symptoms, which because of certain similarities should be defined and differentiated. These are Reiter's disease, Behcet's syndrome, and Stevens-Johnson disease. Among the reports concerning these diseases, not a few can be found in military medical periodicals.

REITER'S DISEASE

In 1916 Reiter (1), in Germany, first reported the condition which now bears his name. Until 1942, when Bauer and Engleman (2) made the first complete American review, the greater part of the literature concerning the subject had appeared in French, German, and Scandinavian publications.

The syndrome is characterized by an acute, nonspecific urethritis, followed in a short time by a purulent conjunctivitis, and somewhat later by an arthritis. Diarrhea has preceded the onset by 10 to 20 days in about two-thirds of the cases reported. There is usually an associated low-grade fever and mild lymphadenopathy. The disease is most often seen in young white males in the twenties and early thirties. The triad is usually complete within a week. Skin lesions have appeared later in the disease, with the primary lesion a superficial vesicle which eventually becomes a shallow ulcer. This is followed by a hyperkeratotic scar resembling keratosis blennorrhagica. These skin manifestations usually occur over the affected joints; when appearing on the penis and scrotum they may resemble herpes progonitalis. In some cases cutaneous lesions resembling erythema nodosum have been reported. In the majority of cases the urethritis and conjunctivitis have been transient, but the arthritis has been persistent, often lasting from 2 to 3 months. Any of the symptoms may

recur, and this is particularly true of the arthritis which in some cases has shown exacerbations for over 2½ years. The joints involved in order of frequency are the knees, ankles, hips, and interphalangeal joints. The arthritis is associated with redness, swelling, and tenderness. Occasionally an hydrarthrosis may develop. There is usually a negative venereal history, and in many cases no history of sexual intercourse for many months previously.

The cause of Reiter's disease is still obscure. Many physicians think the disease to be of an infectious nature, but an organism which can unequivocally be stated as causative has not been demonstrated. Reiter believed it to be due to a spirochete, for which reason he named it "spirochaetosis arthritica." Investigations by others have not verified his findings. Because of the frequent onset with diarrhea, an intestinal infection has been considered by some to be responsible. Various positive cultures, obtained from time to time, have been considered either contaminants or secondary invaders. Some have thought that there was an allergic basis for the disease, while others believe it to be caused by a virus. It has been shown without any doubt, however, that it is not of a gonorrheal nature.

There are no characteristic laboratory findings, although in a majority of cases an increased sedimentation rate, secondary hypochromic anemia and a moderately elevated white blood cell count have been reported. Examination of synovial fluid from involved joints is usually negative for organisms, but an inflammatory cellular reaction is often noted. Blood serologic tests for syphilis, complement fixation tests, and agglutinations have all been reported negative. Electrocardiograms have been normal. Examinations of urethral discharges have been negative for gonococci. The urine may show red blood cells and pus cells during the stage of urethritis, or there may be serious signs of renal involvement (as has been reported in a few cases). Except occasionally where osteoporosis and atrophy of bone have been demonstrated, roentgenograms of the skeletal structures show no abnormality.

The diagnosis rests on the presence of the complete triad, the absence of specific laboratory findings, the extended course, and the slow response to any therapy. The most common associated symptom is diarrhea, which usually precedes the onset of the disease. Skin manifestations have been reported in several cases. Other less common complications and sequelae which may occur are balanitis, cystitis, prostatitis, terminal hematuria, secondary pyelitis, hydronephrosis, scleritis, episcleritis, keratitis, conjunctival ecchymosis, hydrarthrosis, and deforming arthritis.

The duration of the disease is usually 6 to 12 weeks regardless of the treatment. Such medications as penicillin, sulfonamides, neoarsphen-

amine, sodium salicylate, and colchicine have been used with little benefit. Complete bed rest, a nutritious diet, adequate vitamins, and aspirin with codeine for pain have given the most relief. In some instances good results have been obtained from the use of sterile boiled milk or other nonspecific proteins. Proper symptomatic treatment for the abacterial urethritis and for the conjunctivitis are indicated.

The disease is self-limited, usually lasting from 6 to 12 weeks or longer. Relapses are fairly frequent, occurring in about 20 percent of the cases. Rare instances of permanent ocular and joint damage have been reported.

BEHCET'S SYNDROME

Behcet's syndrome received its name from the Turkish dermatologist, Hulusi Behcet of Istanbul, who first described the condition in 1937 (10). However, a condition which was apparently the same, was recognized and reported by Adamantiades in 1931. Within the last few years, more cases have been reported from Palestine, Germany, Sweden, and the United States.

The syndrome is characterized by an aphthous stomatitis, herpetic lesions followed by chancroid-like ulcers of the genitalia, and an iridocyclitis with hypopyon. It is usually accompanied by fever and systemic symptoms in the early stages. There is a marked tendency to relapse, each attack lasting from 1 to 4 weeks. Several attacks may occur within a year. The three tissue localities are often involved successively, though at least 2 are usually affected simultaneously during the course of the disease. As a rule, the mouth or genitalia are involved first, followed by ocular involvement some time later. It is seen about twice as often in males as in females, and most often occurs between the ages of 25 and 40. Mouth lesions are aphthalike, discrete, sharply defined, round or spoon-shaped ulcers of the average size of a lentil. Some of the lesions are covered by a grayish-yellow membrane; others are surrounded by an erythematous halo. The tongue, soft or hard palate, gums, and mucosa of the lips are involved. The genital lesions start as herpes rapidly becoming eroded to form superficial or deep ulcerations and occasionally present undermined edges like a soft chancre. These are seen on the penis, scrotum, labia majora, labia minora, and sometimes on the perigenital areas, and are quite painful and tender. Ocular lesions for the most part occur a year or more after the original onset and are by far the gravest of the symptoms. One eye is involved first, but the other is invariably affected later. The chief clinical picture is one of chronic recurrent hypopyon-iritis (sometimes with an uveitis and neuritis). Various other forms of ophthalmic disease, such as conjunctivitis, keratitis.

phlyctenulae, episcleritis, scleritis, and retinitis hemorrhagica, may present themselves.

Other miscellaneous lesions and symptoms have been reported associated with the syndrome. The most common reported is an erythema nodosumlike eruption which has been associated with rheumatoid pains. Other concomitant findings, such as an acneiform eruption, a papulopustular eruption of the back of the neck, a furunclelike pyoderma, periodic hydrops of the knee, and neurologic symptoms, have been reported. One case terminated in convulsions and death.

As with Reiter's disease, the etiologic basis of Behcet's syndrome remains concealed. Behcet himself was certain that a virus played a role in its production because of the finding of inclusion bodies in cells from oral and genital lesions. These bodies have not been demonstrated by other investigators. Other possible etiologic factors which have been suggested are focal infection, tuberculosis, syphilis, vitamin B deficiency, the staphylococci, and allergy.

Again as with Reiter's disease, the diagnosis depends on the presence of the typical triad of symptoms, the absence of positive laboratory findings, the extended course and resistance to therapy, and a tendency to recurrence of attacks greater than in Reiter's disease. Laboratory and other special studies have contributed nothing to the establishment of the diagnosis, except, perhaps, by the pure negativity of these reports.

Attempts at treatment, as indicated above, have been notably ineffective. Symptomatic and palliative measures are employed when indicated. Such regimens of therapy as salt-poor diets, protein injections, tuberculin, pentavalent arsenic, sulfonamides, vitamins, blood transfusions, and roentgen therapy have been carried out with inconclusive results.

The prognosis is that of a chronic disease, with a marked tendency for recurrence of attacks. The oral and genital lesions usually heal leaving no trace. However, ocular relapses result in severe visual damage, at times with complete blindness. No instance of complete recovery has been reported; every patient is left with ocular damage of some degree.

STEVENS-JOHNSON DISEASE

Stevens-Johnson disease is now generally recognized as an entity. The condition was first fully described by Stevens and Johnson (18) in 1922, although cases which might easily fall into this group were unusually severe forms of erythema exudativum multiforme with pluriorificial involvement, described by von Hebra in 1866. Of recent years it has been reported more frequently by other investigators from the United States, Europe, the Balkans, and Turkey.

This syndrome is characterized by an acute onset with a marked febrile reaction and often severe prostration. The disease is marked by a severe stomatitis leading to sloughing and ulceration, a purulent conjunctivitis, and a skin eruption resembling erythema multiforme. The course is usually from 3 to 4 weeks. The disease is usually seen in young white males, although it occurs often in children (as it did in Stevens and Johnson's cases). The stomatitis is extremely severe, may be ulcerative and bullous, and is followed by sloughing of a gray pseudodiphtheritic membrane, leaving a raw buccal and palatal surface. Resolution of these lesions begins in about 2 weeks. The conjunctivitis is palpebral and bulbar and exhibits a purulent membranous exudate. Corneal ulceration with opacification or panophthalmitis with partial or complete blindness may occur as an unusual aftermath. The skin eruption, usually of the nature of an erythema multiforme, varies in severity. The lesions tend to be papular, macular, vesicular, and bullous, but are more likely to be uniform than multiform. In Stevens and Johnson's cases the lesions were discrete, oval, brownish-yellow papules which later became reddish-brown with yellowish dry necrotic centers in the larger lesions. No vesicles, pustules, or surrounding areolae were noted. The disease has been reported under various names such as eruptive fever with stomatitis and ophthalmia, ectodermosis erosiva pluriorificialis, erythema exudativum multiforme (Hebra) with conjunctivitis and stomatitis, and others.

As with the other two syndromes already discussed, the cause of Stevens-Johnson disease is an unsettled problem. There is one important lead, however, in that in a good many cases the ingestion of certain drugs, including the salicylates, aniline derivatives, and the barbiturates, is followed by the appearance of the syndrome. Any causal relationship, however, is not clear. Certain investigators have considered the possibility that the disease may be an allergic reaction to bacteria without actual invasion, or that there is some as yet undetermined relationship to Vincent's stomatitis or to foot-and-mouth disease. Still others believe the cause may be viral.

The diagnosis of Stevens-Johnson disease depends on the presence of the typical triad of symptoms in an acutely ill and prostrated patient, the lack of positive laboratory findings, the severe and stormy self-limited course, a tendency to recurrence of attacks, and the failure of response to therapy. It is usually seen in young men and children. Laboratory and special studies offer no aid to the diagnosis.

There is no specific treatment for the condition. Much can be done, however, by symptomatic and palliative measures to give more ease and comfort to the patient. Penicillin has been used to combat secondary infection. Vitamins and antihistaminics have been re-

ported helpful adjuncts in the treatment of the disease. Special care should be given the mouth and eyes to prevent residual damage.

The prognosis of Stevens-Johnson disease is guarded. Death may result from severe respiratory infections, exhaustion, or intercurrent secondary infections. Severe complications which usually involve the eye, such as corneal scarring, conjunctival scarring, symblepharon, and at times, total loss of vision may occur. Loss of nails and sloughing of the glans penis have been reported.

COMPARISON OF THE THREE TRIADS

Because of the relative rarity of each of these three syndromes, each of which has a characteristic triad of symptoms of its own, it is not difficult to understand how there might easily be some confusion in differentiating one from the other. To be sure, there are other medical conditions and diseases which should also be considered in the differential diagnosis of each of the three entities in question, but a discussion of these is not within the scope of this article. The main purpose is to attempt to differentiate them, and to point out how they may resemble or differ from one another.

Each one of the syndromes has one predominating sign which is the severest of its triad: in Reiter's disease it is the arthritis; in Behcet's syndrome it is the iridocyclitis with hypopyon; and in Stevens-Johnson disease it is the ulcerative stomatitis. Each is the important key to the individual triad. Ophthalmic lesions comprise a part of the triad in all three conditions: a purulent conjunctivitis in both Reiter's and Stevens-Johnson diseases, and an iridocyclitis with hypopyon in Behcet's syndrome. The eye symptoms and complications tend to be much less severe in the former two than in the latter which results in marked eye damage. Two of the syndromes present lesions of the genito-urinary system: an abacterial urethritis, which is usually very mild and transient, in Reiter's disease; and herpes and ulcers of the genitalia, also usually mild in nature, in Behcet's syndrome. It is true, nevertheless, though not a part of the main triad of symptoms, that there is often a balanitis and urethral discharge associated with Stevens-Johnson disease. Stomatitis is a prominent feature in two of the syndromes. In Stevens-Johnson disease it is extremely severe, followed by ulceration and sloughing, while in Behcet's syndrome it is of a mild aphthous form. The triad in Stevens-Johnson is characterized by a skin eruption which is erythema multiformelike in nature. Although not a part of their accepted triads, at times the other two syndromes present cutaneous manifestations: a keratosis blennorrhagicalike eruption in Reiter's disease and an erythema nodosumlike eruption in Behcet's syndrome. Only one of the three, Reiter's, is characterized regularly by arthritic symptoms.

All three of the syndromes show tendencies to relapse, though this characteristic is seen most notably in Behcet's. Reiter's disease is probably the mildest of the three. Behcet's syndrome is the most chronic, no case having ever recovered from ocular involvement. Stevens-Johnson disease is the most acute and prostrating, and at times fulminating, although mild febrile reactions are seen in the earlier stages of the other two. All three conditions respond very poorly to treatment and no specific treatment has been found for any of them. Laboratory findings and special studies in all three diseases are equivocal, are of limited value, and offer no aid in diagnosis. The cause of each disease is still shrouded in mystery.

Table 1 is an outline of the main symptoms in each of the three triads, together with their associated signs and symptoms, complications, and sequelae, and is presented for the purpose of clarity.

TABLE 1
CHIEF SYMPTOMS

Reiter's disease	Behcet's syndrome	Stevens Johnson disease
(1) Arthritis, acute. (2) Urethritis, abacterial. (3) Conjunctivitis, purulent.	(1) Iridocyclitis with hypopyon. (2) Herpes and ulcers of genitalia. (3) Stomatitis, aphthous.	(1) Stomatitis, ulcerative. (2) Conjunctivitis, purulent. (3) Erythema multiforme-like eruption.
ASSOCIATED SYMPTOMS		
Diarrhea. Keratosis blennorrhagica-like eruption. Hydrarthrosis. Balanitis. Cystitis. Hydronephrosis. Prostatitis. Keratitis. Subconjunctival ecchymosis.	Erythema nodosum-like lesions. Acneiform eruption. Conjunctivitis. Scleritis. Episcleritis. Retinitis. Keratitis. Phlyctenulae. Neurologic signs. Hydrops of knee.	Balanitis. Urethritis. Corneal scarring. Conjunctival scarring. Symblepharon. Panophthalmitis. Total loss of vision. Loss of nails. Slough of glans penis.

Because of the increase in frequency of reports in the literature concerning them, because the cause in each instance is obscure, and because of their extreme resistance to treatment, a definite challenge is offered to every medical officer to make all possible effort, when the opportunity presents itself, to add to the present incomplete knowledge of these three triple-symptom complexes.

SUMMARY

1. Three relatively unusual syndromes are briefly discussed: Reiter's disease, Behcet's syndrome, and Stevens-Johnson disease.

2. These three triple-symptom complexes are compared and differentiated, with the hope that a clearer understanding of each of them may be engendered.

3. A plea is made to all medical officers for further careful study of these three diseases in order to add to the meager knowledge regarding specific causes and treatment.

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THE STEVENS-JOHNSON SYNDROME

Report of Two Cases

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DURING recent years an increasingly large number of case reports has appeared (1) (2) (3) (4) (5) (6) describing a syndrome characterized by dermatitis, stomatitis, ophthalmia, urethritis, balanitis, and pneumonia. These symptoms appear in varying combinations and all are very rarely present in the same patient. Cases have been reported frequently over a period of many years under a variety of names.

Alibert and Bazin in 1822 described dermatitis with ophthalmia and mouth involvement. Since then, many additional cases outlining the other features of the symptom complex have appeared in the literature. Most of these early reports appeared in the European literature, but since 1900 occasional references have appeared in the American journals. Among the names assigned the condition were Erythema multiforme exudativum (7), ectodermosis erosiva pluriorificialis (8), ulcero-membranous stomatitis (9), muco-cutaneous fever (10), dermatostomatitis (11), and mucosal respiratory syndrome (5). Finally, the use of the eponym, Stevens-Johnson syndrome, has followed the appearance of the report in the American literature of 1922 (12).

The initial symptoms of this disease are usually malaise, fever, sore throat, and cough. The more typical manifestations then appear several days later. A vesicular, papular or bullous skin eruption, with a predilection for the extensor surfaces of the arms and legs, may be seen. Accompanying or following this, the changes in the mucous membranes may have their onset. Vesicles or bullae appear in the mouth. One or two days later these ulcerate and become covered with a thick white exudate. At times these ulcers are so numerous that the entire oral mucous membrane seems to be covered.

The ophthalmia most frequently will present as a simple catarrhal conjunctivitis. In some patients, however, this process becomes purulent or pseudomembranous, and cases of permanent optic damage have been reported (13).

Involvement of the glans penis and urethra also may be seen occasionally. The lesions of the glands are described as being macular or vesicular and at times a urethral discharge is present.

Pneumonia has been reported frequently (2) (10) (14). This usually simulates the virus type of the disease clinically and often is discovered only following roentgenography.

Systemic reaction to the disease, including fever and prostration, shows a wide variation. Some cases will be extremely mild, not even requiring bed rest, while others will be critically ill. A small proportion die.

The disease is found most frequently in children and young adults; the seasonal incidence is highest in the spring and fall. The infection will persist, as a rule, over a period of 3 to 4 weeks, but there is a marked tendency for the condition to recur.

The laboratory findings are not helpful. There is usually a leukocytosis but the blood count may be normal. Blood cultures are usually negative. The urine is normal unless the urethra is involved.

In differential diagnosis, Vincent's stomatitis, drug sensitivity, pemphigus, urethritis, and infectious stomatitis must be ruled out. When all the features of the disease are present there are few other ailments with which it can be confused. However, when only one or two of the signs appear, confusion with other disorders is difficult to avoid.

Up to the present the cause has not been determined. Attempts to transmit the infective organism to animals have been unsuccessful (2). Blood cultures have not proved helpful.

In treatment, the use of both penicillin and sulfonamides seem to be worth while. Wright, Gold, and Jennings (4) suggest that the use of these agents will probably decrease the complications. Otherwise only mild mouth washes and boric acid irrigations for the eyes seem to have been used.

CASE REPORTS

Case 1.—This 18-year-old patient was admitted to the sick list on 29 September 1947 with the chief complaints of cough and shortness of breath, which he stated had been present for 48 hours. The history was otherwise negative except that he had been treated for a mild sore throat about 1 month previously.

Physical examination revealed a patient who appeared acutely ill. He was mildly dyspnoeic and there was a moderate cyanosis of the nail beds. There were signs of consolidation over the left lower lobe. Examination was otherwise normal except for the presence of a temperature of 101° F.

Roentgenogram showed a soft, mottled infiltration in the left base, which was interpreted as indicating the presence of a virus pneumonia. The white blood count was 14,800 with a normal differential count. Urinalysis was normal. Blood cultures, throat and mouth smears were negative.

Treatment with penicillin, 50,000 units every 3 hours, was started; and during the following days moderate improvement was noted in the patient's general

condition. However, on 6 October 1947 he complained of a soreness of the eyes, and a purulent ophthalmic exudate was noted. At the same time, several wheals appeared over the skin of the forearm and thigh. This was thought to be an urticarial reaction due to penicillin sensitivity, and the administration of this drug was discontinued.

His condition steadily became worse, his temperature rose to 103° F., and he again became extremely cyanotic and dyspnoeic. Penicillin therapy was again started and sulfadiazine added in doses of 1 gram every 4 hours.

In spite of this, the purulent conjunctivitis did not improve, and on 9 October 1947 he complained of a sore mouth. Examination showed almost the entire oral mucous membrane involved with small vesicles and bullae. During the following 2 days, this process rapidly extended. The lesions ulcerated and became covered with a gray exudate until the entire oral mucosa was involved. It became impossible for the patient to take any nourishment by mouth because of the severe pain. Dilute potassium permanganate mouth washes were started in addition to the penicillin and sulfadiazine.

On 12 October 1947 he began to improve, and during the following days the ophthalmia and stomatitis gradually healed. By 20 October 1947 a roentgenogram of the chest was negative and the mouth lesions had completely disappeared. The patient was discharged to duty on 26 October 1947 with only a slight conjunctival injection remaining as evidence of his disease.

Case 2.—This 21-year-old patient entered the hospital on 4 December 1947 complaining of a "sore mouth" of 5-day duration. He stated that at the time of onset of his illness he had noticed small vesicles on his lips. These rapidly enlarged to become bullae and the process spread to the inner surfaces of the lips and cheeks. The following day vesicles and bullae developed on the skin of his palms and soles from where they spread to the extensor surfaces of both the upper and lower extremities. During the following days the lesions in the mouth ulcerated and became covered with a gray membrane. When seen at the time of admission the patient complained of severe mouth pain, especially when eating. The history was otherwise negative, except for the disclosure of the fact that the patient had suffered a similar illness with mouth and skin lesions in August of 1946.

Physical examination showed several large ulcerations of the oral mucosa, including that of the cheeks, palate, gums, and tongue. These lesions were covered with a dirty gray exudate which disclosed a bright red base when wiped off.

The skin of the palms and soles and the extensor surfaces of the upper and lower extremities had numerous lesions varying from maculae with a central bluish white area surrounded by a zone of bright erythema to large hemorrhagic bullae. Physical examination was otherwise normal. The temperature was 99.6° F.

Laboratory examination showed a white blood cell count of 8,200 with a differential count as follows: segmented cells, 68; eosinophiles, 3; lymphocytes, 27; and monocytes 2.

Urinalysis was normal. Erythrocyte sedimentation rate was 6 mm. hour. Kahn test was negative. Throat cultures showed the presence of gram-negative cocci occurring singly, in pairs, and in clusters.

Treatment consisted of penicillin intramuscularly, 50,000 units every 3 hours, sulfathiazole ointment to the lips, and mouth washes. Under this regimen the patient improved rapidly. The lesions in the mouth healed and the skin lesions had disappeared by 15 December 1947, 16 days following the onset of his

symptoms. He was discharged to duty with no residual signs of his recent infection.

COMMENT

Case 1 is of interest because at its onset it seemed typical of a virus pneumonia, and only after 2 weeks of observation when the oral and ophthalmic involvement occurred, was it possible to reach the correct diagnosis. The patient was critically ill for over a week and it was not felt by those attending him that penicillin or sulfadiazine were of assistance in controlling the disease.

Case 2 represents an extremely mild variation, with the skin and oral involvement predominating. It serves as an example of the disease's tendency to recur which has frequently been mentioned in other reports. This patient seemed to receive some benefit from the use of antibiotics, although, obviously, it is impossible to judge what his course would have been without penicillin.

SUMMARY

Two cases of the Stevens-Johnson syndrome are reported. One patient was extremely ill with stomatitis, ophthalmia, and pneumonia. The other showed few systemic symptoms, and had involvement of the skin and mouth only. It is felt that this disease is of importance to the naval service not only because of the possibility of serious sequelae, but because it tends to occur with comparative frequency in groups living in close proximity. Because of its protean manifestations, the disorder may be seen initially by the dermatologist for the skin lesions, by the dentist for the stomatitis, by the urologist for the urethritis, by the ophthalmologist for the conjunctivitis, or by the internist because of the pneumonia.

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SIMULTANEOUS DIABETIC COMA AND CAVERNOUS SINUS THROMBOSIS

Report of a Case

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DIABETIC coma and cavernous sinus thrombosis are both serious medical emergencies. The simultaneous occurrence of both conditions in the same individual is considered of sufficient rarity and interest to justify its report.

CASE REPORT

The patient, L. C., a 23-year-old white married female, was admitted to the U. S. Naval Hospital, Portsmouth, Va., on 12 February 1946, in coma.

History obtainable from the family revealed that this woman had not been entirely well for the preceding 6 months; during that period she had lost 30 pounds of weight, and had noted progressively increasing polydipsia, polyphagia, and polyuria. A sister had diabetes mellitus, and was under insulin therapy.

Six weeks prior to admission she developed a painful, draining, right ear, and was treated elsewhere with "sulfa pills," with temporary remission. However, 2 weeks before admission, she began to have right-sided earaches and otorrhea again, and on the evening before admission had an unusually severe earache, accompanied by a severe right frontal headache. She retired early, vomited several times, could not be aroused the next morning, and was then brought into the hospital.

Physical examination: An emaciated, comatose young white woman whose color was sallow. Respirations were loud, rapid, and regular. The temperature was 96.4° F. rectally, the skin was warm and dry, and the extremities cool. The breath had a faint odor of acetone. There was a moderate degree of nuchal rigidity. The eyeballs were markedly soft and sunken. The right pupil reacted only slightly to light; the right globe was immobile, while the left globe rolled continuously. The right fundus showed blurring of the disk and slight pallor of the retina, without engorgement of vessels. The right corneal reflex was absent. The left eye was entirely normal. The right ear canal was filled with old purulent debris and the wall was edematous. After cleansing, there was found an active chronic otitis media with a pulsating perforation. No post-auricular swelling was present.

The lungs contained scattered moist râles at both bases. Respirations were loud and rapid. The heart was normal except for a sinus tachycardia, rate 130. There were no abdominal abnormalities other than distention. Rectal examination revealed only fecal impaction.

Neurologic examination: Hypoactivity of the deep reflexes, absence of abdominal reflexes, and paresis of cranial nerves 3, 4, 6, and the ophthalmic branch of 5, on the right.

Laboratory studies: Red blood cell count, 4.5 million; hemoglobin, 14.0 grams. White blood cell count, 26,550; differential count, 86 percent neutrophils and 14 percent lymphocytes. Urine: pH, 5.0; specific gravity, 1.022; albumin, 30 mg. percent; sugar, 3 percent; acetone, strongly positive; diacetic acid, negative. Blood chemistry: blood sugar, 567.2 mg. per 100 cc.; blood nonprotein nitrogen, 67.4 mg. per 100 cc.; plasma CO₂ combining power 28.5 volumes percent. Kahn and Mazzini tests were negative. Spinal fluid: Pressure markedly reduced, required aspiration; no organism on smear or culture. Culture of middle ear contents revealed hemolytic staphylococcus aureus. Blood cultures were negative.

Diagnosis and treatment: On the basis of the foregoing findings, a diagnosis of diabetic acidosis was made. Treatment was instituted at once, following in general the plan of Joslin (6), Root (7), and others. One hundred units of regular insulin were given at once, and 50 units hourly thereafter. Despite these doses, the blood sugar rose to 824 mg. per 100 cc., 8 hours after admission. The patient was then given 150 units of regular insulin in addition to the 50 units hourly. Continuation of this vigorous therapy, including a total of 8,000 cc. of isotonic saline solution intravenously, brought the blood sugar down to 84 mg. per 100 cc. and the CO₂ combining power up to 45.5 volumes percent 20 hours after admission. Thereafter, the diabetes remained under control, with the blood sugar fluctuating between 80 and 200 mg. per 100 cc. The patient received at least 100 grams of glucose each 24 hours as 5 percent dextrose in saline, with additional intravenous saline as indicated.

Of more interest, perhaps, was the progress of the complicating intracranial process. Three hours after admission, reexamination of the right eye revealed persistence of paresis of the third, fourth, sixth cranial nerves and the ophthalmic branch of the fifth. In addition, there was noted astonishing pallor of the entire right retina, with collapse of the retinal vascular tree; only beaded remnants of the venules could be seen. These are the signs of occlusion of the central retinal artery. An hour later there was noted a one square centimeter in size area of blanched-out skin over the nasofrontal angle, corresponding to the distribution of the cutaneous nasal branch of the right ophthalmic artery (8). This area became gangrenous and the entire right globe underwent degeneration during the succeeding hours. On the basis of these findings and the presence of an active chronic middle ear disease on the same side, a diagnosis of cavernous sinus thrombosis, with occlusion of both the ophthalmic artery and vein, was made (9) (10) (11).

Following correction of the dehydration, the patient's temperature was 105° F., and she continued to run a septic fever thereafter. Nine hours after admission of the patient treatment with penicillin, 50,000 units every 3 hours, and 12 grams of sodium sulfadiazine intravenously each 24 hours, was started.

Simultaneously, intravenous heparin was given in an attempt to prevent further thrombosis and perhaps alleviate that already present (4) (11). By performing hourly clotting times, the patient's clotting time was kept between 15 and 30 minutes, her normal time being 1 minute, 30 seconds. These measures were maintained throughout the course.

The patient became responsive at intervals, on the second and third hospital days. However, despite continuation of all these therapeutic measures, together with plasma transfusions on the third and fourth days, she again became deeply comatose on the afternoon of the fourth day. The urine became grossly bloody and scanty. The nonprotein nitrogen was reported as 125 mg. per 100 cc. and CO₂ combining power 26 volumes percent. Yet the blood sugar was only 208 mg. per 100 cc. In the early evening increased respiratory difficulty was

noted, the breath had a uriniferous odor, and examination of the nasopharynx revealed extensive sloughing and accumulation of fibrinous debris; the chest contained coarse râles. Oxygen and careful suctioning were instituted, but the patient suddenly became cyanotic, breath sounds and expansion of the right chest became markedly decreased, and the patient died late in the evening of the fourth hospital day.

Permission for post-mortem examination was refused.

COMMENT

As would be expected from the severity of the complicating infectious process, this patient showed extreme resistance to insulin for the first 24 hours of treatment. Nonetheless, adequate control of the diabetic acidosis was achieved and maintained.

We feel that the chain of events in the development of the cavernous sinus thrombosis and subsequent changes took place as follows: There was extension of the active otitis media via the petrous apex of the temporal bone to the cavernous sinus (9). There ensued the usual involvement of the third, fourth, sixth cranial nerves and the ophthalmic branch of the fifth. In addition to the expected thrombosis of the ophthalmic vein and its tributaries, this case presented unmistakable evidence of sudden and complete occlusion of the right ophthalmic artery as indicated by the sudden astonishing pallor of the right retina with collapse of the vascular tree, and concomitantly an area of cold blanched skin in the distribution of the cutaneous branch of the ophthalmic artery (nasal artery) (8).

Subsequent changes were those of gangrene following this ischemia: First, steamy changes in the cornea within another 2 hours, and then by the time death occurred, advanced degeneration of the entire orbital contents, periorbital skin, and the nasopharynx.

The immediate cause of death was presumably obstruction of the right main-stem bronchus by aspirated fibrinous debris from the nasopharyngeal sloughing. However, in view of the terminal hematuria, oliguria, and elevation of the blood nonprotein nitrogen, multiple septic emboli may have been responsible, along with the obvious and unresponding septicemia.

Of special interest were the signs of occlusion of the right ophthalmic artery, and the devastating effects of this grave medical emergency in an individual, already in poor physical condition from uncontrolled diabetes mellitus.

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CYSTIC TUMORS OF THE MAXILLA

With Report of a Case of "Pseudocholesteatoma"

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ONE of the earliest investigators to report on "pearly tumors" of the leptomeninges was Cruveilhier in 1829 (1), although Leprestre and Dupuytren had previously given descriptions of similar tumors sufficiently clear to leave no question about their common identity. In 1838, Johannes Mueller described three cases of pearly tumor and gave the name "cholesteatoma" to them because they contained cholesterin crystals. This unfortunate designation has been responsible for a good deal of confusion because it is not unusual for cholesterin crystals to be found in any degenerative type of tumor.

Further confusion is added by the use of the term "psuedocholesteatoma," which seems to have been the brain child of otolaryngologists who were attempting to describe certain cystic expanding tumors of the paranasal sinuses in which cholesterol clefts were noted by the pathologist. A clarification of the entire subject is sorely needed.

True cholesteatomas are tumors with which most neurosurgeons have had some experience. A cholesteatoma, or epidermoid, is a rare embryonic tumor derived from epithelial "cell rests" which have become accidentally separated from their fellow cells in the process of histogenesis. They are called epidermoids because only epidermal structures are found in the walls of these tumors. Up to 1946 there had been 26 cases of true epidermoid or cholesteatoma of the cranium reported, most of them occurring in the parietal bone, or in the squamous portions of the frontal, temporal, and occipital bones. These tumors are composed of a distinct pearly capsule surrounding an inner waxlike laminated substance which is easily crushed and which feels like soap when rubbed between the fingers. The tumors are epithelial-lined cysts, which are found in the cranium, and may also be found in the leptomeninges and in the walls of the ventricles. Such tumors are rarely if ever found in the maxilla. For one possible case, de-

scribed in a recent article (2) the pathologist reported that "no cell or cell structure could be visualized. All the mass presented was uncharacteristic, necrotic debris." In the absence of more definitive histologic evidence it is not felt that the diagnosis of cholesteatoma is confirmed by the pathologist's report.

Pseudocholesteatomas, or cholesteatomalike tumors, are found only rarely in the paranasal sinuses. Usually they must be diagnosed on clinical symptoms and by elimination of other possible cystic tumors from the diagnostic picture. The pathologist's help is usually required for a definite diagnosis.

CYSTS AND CYSTIC TUMORS OF NOSE AND PARANASAL SINUSES

Cysts are not strictly tumors. They are dilated ducts or glands usually resulting from obstruction of the duct and an accumulation of the secretion of the glands with which the duct is associated. In a true cyst the wall of the cavity is usually lined with epithelium. The cyst may grow to large proportions as the result of the accumulation of the secretory products of the lining cells. Any of the seromucinous glands of the nasal or sinus mucosa may undergo cystic degeneration, especially in the presence of chronic inflammation, when the cysts may attain considerable size. They may fill an entire sinus cavity and produce pressure symptoms upon surrounding bony structures. An expanding lesion of this type is typified by the mucocele. A mucocele is a cystic degeneration of the mucous membrane of the sinuses, most frequently the frontal sinus, where there is an expanding tumor formation. It produces a painless smooth swelling in the roof or wall of the orbit, usually appearing just above the medial canthus of the eye. A mucocele may occur in the ethmoid labyrinth by the same process, and often extends downward into the nose. There is usually very little evidence of inflammation. The mucocele is lined with a modified type of sinus mucosa that may ultimately atrophy from pressure; or it may be lined with respiratory type of mucosa. The contents of a mucocele are usually thick, yellowish brown, gelatinous, tenacious, mucouslike exudates or purulent fluids. Mucocele is rarely found in the maxillary antrum.

Another type of cyst not infrequently found in the superior maxilla and antrum is the radicular cyst, arising from epithelial rests around the alveolar structures and roots of the teeth. They may be dentigerous in origin or may represent autolyzed pus pockets at the roots of the teeth. In some instances they become very large and invade the antrum.

Dental tumors in general arise from embryonal remnants of the enamel organ, which, together with the dentine papilla and the mesenchymal tooth sac, forms the tooth follicle. The work of Malas-

mez has done much to simplify the classification of these tumors. Of the cystic tumors of the jaw associated with the teeth, the most important are the radiculodental, described above; the dentigerous or follicular cyst, which, for some unknown reason, is most frequently found in the lower jaw associated with unerupted teeth; and the adamantinomatous cyst. The adamantinomas are more common in the inferior maxilla, but may occur in the superior maxilla. Eggston and Wolff (3), describe a large cystic adamantinoma of the superior maxilla which had invaded the antrum and the nose, measuring 3.0 by 2.5 by 2.0 centimeters in size. It contained many cysts which were filled with sagolike granules that could be expressed under pressure. Histologically, the tumor resembled a squamous-cell epithelioma in which there were some ameloblasts of columnar nature, and considerable mitosis. The cyst lining was composed of stratified squamous epithelium, and in some areas, of cuboidal epithelium.

Most of the cysts of the nose and paranasal accessory sinuses contain mucoid or gelatinous material, and are lined with squamous, columnar, or cuboidal epithelium. Mucous cysts, however, may be lined with a smooth layer of fibrous connective tissue, probably caused by pressure atrophy of the epithelial lining, according to Gordon New (4).

Of the rarer cysts found in the nose and paranasal sinuses, dermoids form an interesting group. Dermoid cysts have been found which contained teeth, hair, and bony structures that have involved the antrum and ethmoid areas. They probably represent vestigial remains of the skin and its appendages misplaced in development of the embryo. Epidermoid cysts may also be found in this region as an epidermoid invagination. These may occur in the nose and nasopharynx, and may represent embryonal surface epithelium but not other cutaneous appendages.

Cystic degeneration occurs in many tumors especially in the mixed or salivary type, which are fairly common in the nose, nasopharynx, and sinuses.

In chronic infections of the sinuses when obstruction of the natural opening develops, purulent exudate may fill the entire cavity. The continued outpouring of exudate which cannot escape can lead to increasing pressure and eventually the thinnest portions of the bony sinus walls may yield to the constant pressure. Later on, the purulent fluid can undergo autolysis with the liberation of insoluble fats, including cholesterol. The wall of such a cystic cavity would contain granulations and cholesterol crystals, and may or may not have an epithelial lining. This type of cyst would be considered a cholesterol-atomatus cyst. Sometimes, the contents of such a cyst may be cheesy, with a very foul odor. The chronic expanding of such a cyst may produce a cavity of huge proportions.

The histologic evidence in the case to be presented made diagnosis in conventional terms difficult. The growth, a cystic tumor of the maxillary antrum, was of an unusual type about which there has been much theorizing but few known facts. Because the tumor encroached on the upper alveolar process it was considered desirable to make use of the combined knowledge and experience of the otolaryngologist and oral surgeon, and close cooperation between these two specialties has been maintained throughout the handling of the case.

CASE REPORT

A 55-year-old white male first presented himself on 2 February 1948 with established diagnoses of chronic dacryocystitis right eye, and mucocele right antrum. These diagnoses had been made by the ophthalmologists and otolaryngologists who had treated the patient before his transfer to this hospital.

According to the patient, he had first noted symptoms 4 months before admission. In November 1947 he had consulted a local ophthalmologist because of excessive spillage of tears from the right eye. No other complaint was made at the beginning.

The ophthalmologist tried to relieve the lacrimation by slitting the inferior lacrimal canaliculus, and followed this by frequent probings and irrigations of the right lacrimal sac. After a month of this treatment with no relief, the patient consulted an eye, ear, nose, and throat specialist who also devoted his attention to the right lacrimal drainage system with very little relief of the symptoms. The patient became disturbed because of lack of sustained improvement, and consulted a third eye specialist. This consultant recommended roentgenograms of the paranasal sinuses. These revealed evidence of a cystic tumor of the right antrum. Apparently, this was considered to be a coincidental finding or a condition of secondary importance because further treatment of the patient was directed toward the right eye. After each probing and irrigation of the right lacrimal sac the tearing seemed to be relieved, according to the patient. Finally, however, after a routine treatment of probing the inferior canaliculus of the right eye, followed by irrigation of the lacrimal sac, the irrigating fluid entered the infraorbital soft tissues, causing considerable swelling, edema, and dull aching pain. These symptoms and signs persisted in spite of conservative local therapy, and the patient was sent to this hospital for further study and treatment with the diagnoses enumerated above.

The presenting complaint at this activity was "painful red eye and tender face" on the right side, with excessive tearing also mentioned. There was no complaint referable to the nose. Examination on admission to the eye, ear, nose, and throat service revealed diffuse redness, injection and slight swelling of the bulbar and palpebral conjunctiva of the right eye, with pooling of the tears in the inferior cul de sac. Tactile tension was low normal in both eyes, confirmed at later examination with Schlötz's tonometer. The inferior canaliculus showed a distorted slitlike punctum, which was covered by a whitish membrane that was easily removed. Gentle irrigation of the inferior canaliculus revealed a patent drainage system emptying into the nose. Further examination of the right eye revealed no evidence of pathology. The media were clear, and the fundus was normal for the age of the patient. The left eye was within normal limits.

Beneath the right eye there was found a puffy pale edema of the soft tissues in the infraorbital area, with some tenderness on palpation. The entire right

side of the face presented the appearance of a puffy swelling. Anterior rhinoscopy on the right side revealed a well vascularized, dull red, soft, fleshy tumor mass protruding into the right naris from beneath the inferior turbinate on the right side. This tumor caused almost complete obstruction of the right side of the nose. Oral examination revealed an edentulous mouth with poorly fitting dentures. All of the teeth had been removed 10 years before the onset of the present illness. The anterior surface of the upper alveolar process and the anterior wall of the right maxillary sinus were bulging and felt soft and spongy to the palpating finger. The entire right half of the hard palate imparted the same sensation on examination. A 14-gage needle was pushed through the soft bone of the right canine fossa, and 15 cc. of a thick, cheesy, yellowish-brown, foul discharge was obtained. Lipiodol was instilled through the same needle and roentgenograms were taken. The plates revealed a small amount of mucous membrane thickening of the right antrum, and a fluid level filling approximately two-thirds of what appeared to be a greatly enlarged sinus. The lipiodol was pooled on the floor of the sinus, and extended into the right naris, indicating destruction of the medial wall of the sinus.

On the next day, a 16-gage needle, attached to a 20 cc. Luer lock syringe, was inserted into the same area in the anterior wall of the right maxillary antrum, and simultaneously a speculum was inserted into the right nostril allowing visualization of the tumor mass coming from the inferior meatus. As the piston of the syringe was withdrawn, a brownish fluid containing many highly refractile crystals appeared in the syringe, and the tumor in the nose slowly disappeared, apparently into the right inferior meatus. When the piston was pushed down into the barrel of the syringe, the nasal tumor slowly reappeared from under the anterior tip of the inferior turbinate and gradually filled the right side of the nose again. The location of the tumor stem under the anterior tip of the inferior turbinate, in the region where the nasolacrimal duct empties, offered a ready explanation for the excessive lacrimation which has been the chief complaint of the patient throughout his illness.

By this time, it was obvious that the pathological lesion was in the right maxillary sinus, but whether it had its origin in a dentigerous cyst or in a radiculodental cyst of the alveolus could not be determined preoperatively. The absence of roentgenographic evidence of tooth remnants made a diagnosis of dentigerous cyst unlikely; and the long lapse of time between the full extraction of teeth and the appearance of the cystic tumor made a diagnosis of radicular cyst untenable.

It remained then to differentiate between adamantinomatous cyst, mucocele, mucous cyst, or pseudocholesteatoma. The poor history obtained from the patient, who attributed all of his distress to his ocular condition from the very beginning, offered no help in arriving at a proper diagnosis. The clinical examination revealed only an expanding cystic tumor which had either arisen in or invaded the right maxillary antrum and had then grown beyond the confines of the antrum to cause bulging of its walls into the nose, the hard palate, the alveolus and the face. It was decided to remove the tumor and to ask the help of the pathologist in making the diagnosis.

The surgical procedure was simple. Under regional block anesthesia an incision was made in the alveolar process and the hard palate posteriorly on the right side, disclosing a tissue-paper thickness of bone. This was incised and was found to have little resistance. As soon as the incision had been made, a thick fibrous capsule bulged into the opening made by the incision. This capsule obviously contained fluid, and had the characteristic clinical appearance of a dentigerous cyst. Separation of the sac was performed with ease except at

the inferomedial aspect where it seemed to be adherent to the nasal tissues. At this location, the sac was torn, and many thick yellowish-brown foul-smelling cheesy particles were evacuated. The adherent portion of the sac was then thoroughly curetted and the remainder of the sac was delivered easily through the original incision. A large opening was next made through the lateral nasal wall in the inferior meatus of the nose to insure drainage. The cystic mass appeared to have extended from the midline of the entire hard palate to the lateral wall of the right maxillary antrum. The pedunculated off-shoot which had invaded the right side of the nose through the inferior meatus had caused pressure atrophy and deformity of the interior and middle turbinates of this side of the nose. In view of this extensive expansion, causing pressure atrophy in every direction, it seems remarkable that no symptoms were experienced by the patient until the growth interfered with the drainage of tears from the right eye into the nose.

The pathologist's report is given in its entirety:

Gross examination: Specimen consists of a formalin-fixed tissue of a hollowed, ovoid appearance about 3 x 4 cm. with an estimated aggregate weight of 1 gram. With the main specimen are many tissue fragments.

Microscopic examination (figs. 1 and 2): Sections show granulation tissue characterized by an extensive fibrous tissue reaction in which many chronic inflammatory cells, sheets of xanthomatous cells and numerous cholesterol clefts are present. In addition there are many foreign-body type giant cells, especially around the cholesterol clefts. Masses of old blood pigment and calcium and iron pigment are present. The fibrous tissue is hyalinized in areas and forms the wall of the cystic mass. In all sections studied (30) no squamous epithelial lining is seen. Some of the sections include bone, on the other side



Figure 1.—Low-power magnification of a sagittal section through the specimen. E, ciliated epithelial lining of the compressed antral cavity; B, bone of the lateral nasal wall, demonstrating extensive erosion; G, granulomatous tissue.

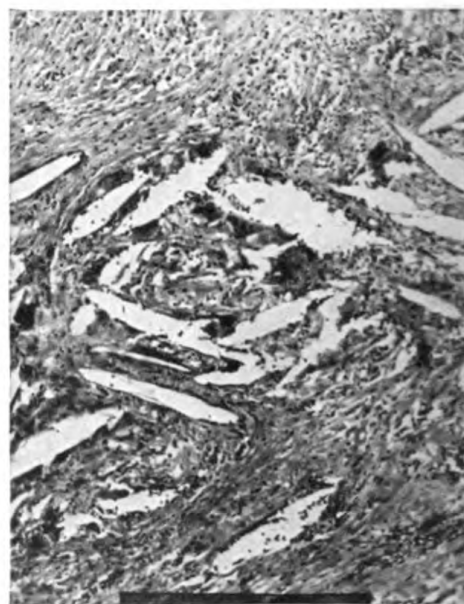


Figure 2.—High-power magnification of the same specimen, demonstrating many cholesterol clefts and foreign-body giant cells.

of which the tissue is lined by pseudo-stratified ciliated columnar epithelium of the type seen in the nasal sinuses. There is no evidence of specific infection or of malignancy.

The over-all histologic appearance is that of a nonspecific inflammatory lesion with extensive degenerative changes. It is entirely compatible with the entity known as pseudocholesteatoma.

Pathologic diagnosis: Chronic granulation tissue showing extensive degenerative changes, compatible with one of the following entities in order of preference: (a) Pseudocholesteatoma; (b) degenerated radicular cyst; (c) degenerated cholesteatoma.

Convalescence from the operative procedure was uneventful. On the day following surgery the excessive lacrimation had ceased. By the third post-operative day most of the swelling and edema of the infraorbital tissues and of the tissues overlying the anterior face of the maxillary antrum had subsided almost completely.

A fairly large fistulous opening into the antrum developed, as expected. No attempt was made to close it, but time was allowed for the laying down of new bone, or possible development of complications. At the end of 3 months, during which time the patient was observed closely with roentgenograms and clinically as an outpatient, there was complete closure of the surgical defect under a denture, and new bone was laid down in the antrum walls and about the alveolar process.

SUMMARY

1. A brief review of cystic tumors of the maxilla and accessory sinuses is presented.
2. A case of cystic tumor of the maxillary sinus is discussed and a diagnosis of pseudocholesteatoma is suggested.

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A SIMPLIFIED TECHNIQUE FOR ACRYLIC JACKET CROWNS

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THE technique to be described is not altogether original but rather a condensation employing steps from various other techniques. In certain cases, some of the steps or procedure in this technique, such as wax bites and articulation of opposing models, can be dispensed with.

If the following procedure is used, two visits are required of the patient. The first visit will require approximately 1 hour; the second visit, 35 to 45 minutes.

This technique is presented here in outline form for brevity. A left maxillary central incisor is the subject tooth for illustrations (fig. 1).

THE FIRST VISIT

1. Anesthetize the tooth to be prepared for the acrylic jacket restoration.

2. Select the desired shade or shades for the finished crown, in *natural* light. A New-Hue shade guide is adequate.

3. On a laboratory card make a rough outline of the tooth to be restored. Draw in all peculiarities or conditions to be duplicated in the finished crown (fig. 2).

4. Make proximal slices, using a lightning or "Joe Dandy" disk (fig. 3).

5. Contour a seamless copper band to fit the gingival margin of the tooth before proceeding further with the preparation. It is much easier and more kind to the gingival tissue to properly fit and contour the impression band at this time rather than after the preparation has been completed.

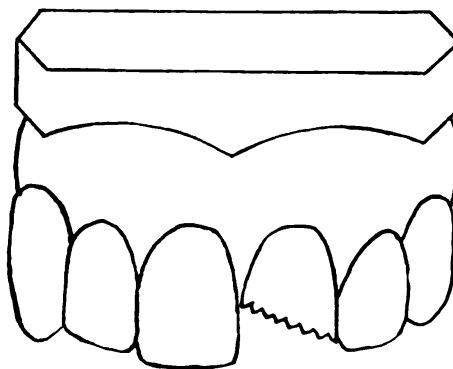
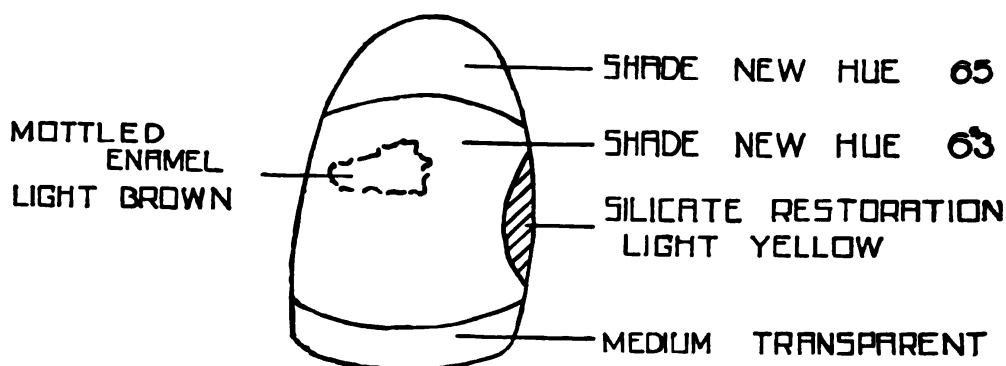
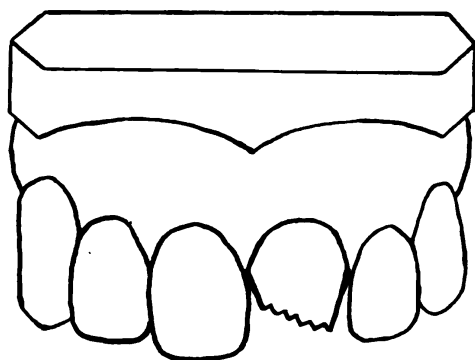
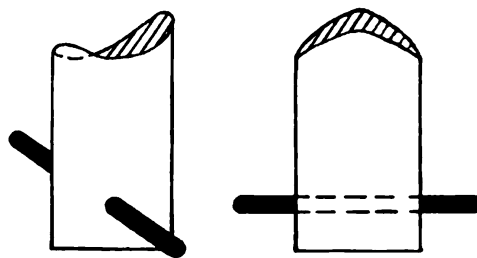


Figure 1.

*Figure 2.*

6. Finish a conventional preparation for a jacket crown (1 millimeter shoulder, if possible, under the free margin of the gingiva).

7. Drill two small holes in the copper band which was previously fitted and through these holes run a piece of wire three-fourths of an inch long (cut paper clip). This wire will act as a handle, enabling the operator to remove the impression along the long axis of the preparation with minimum distortion of the impression (fig. 4).

*Figure 3.**Figure 4.*

8. Take the impression, using red impression compound in the previously prepared copper band. It is suggested that the red "stick-form" compound be used to facilitate handling. An open flame is quite satisfactory in softening the compound for introduction into the copper band.

9. Adapt a core of inlay wax over the preparation and take a tray compound impression of the anterior portion of the arch, removing the wax core along with the impression. Take an impression of the opposing arch and a wax bite to register centric relationship of the jaws.

10. Place a celluloid crown form, filled with zinc oxide eugenol paste, over the preparation and dismiss the patient.

LABORATORY PROCEDURE

1. Box the band impression with a strip of 28-gage sheet casting wax, having the wax extend $1\frac{1}{4}$ inches beyond the copper band to form the root end of the die. Pour this in artificial stone.

2. When the stone die has set, separate the die from the impression. Carbon tetrachloride will remove any residual compound material from the die. Taper the root end of the die for easy removal from the master model. Also, cut a vertical groove in the root end for positive seating in the master model (fig. 5).

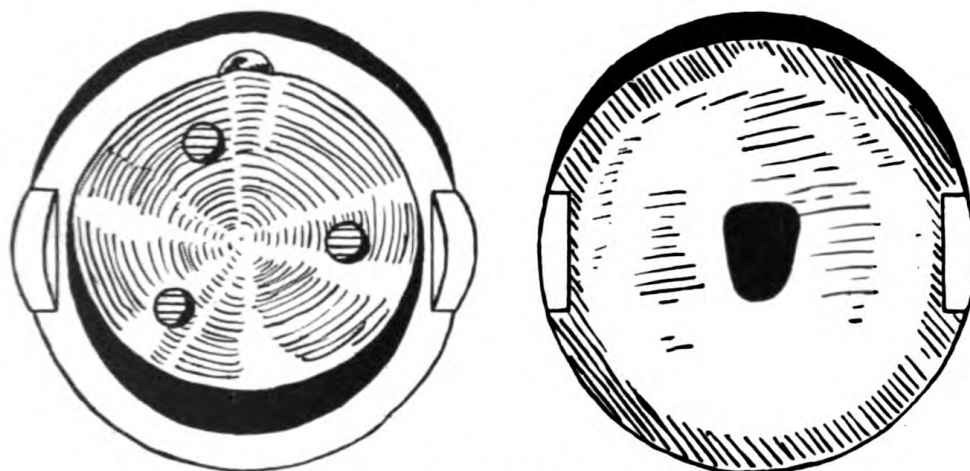


Figure 5.

3. Seat the die in the wax core of the compound impression of the arch and seal the gingival shoulder of the die with a warm spatula. Lubricate the root end of the die with a light coat of vaseline, box the impression, and pour the master model in stone. In pouring the master model, leave the root end of the die exposed to facilitate removal from the master model. When the master model has set, separate it from the impression, trim, and shape.

4. Mount the upper and lower casts on an articulator, using the wax bite as a mounting index.

5. Remove the die from the master model. Trim the model slightly at the labial and lingual areas around the hole in the die. Slightly relieve the proximals adjacent to the hole to insure proper contacts in the finished crown.

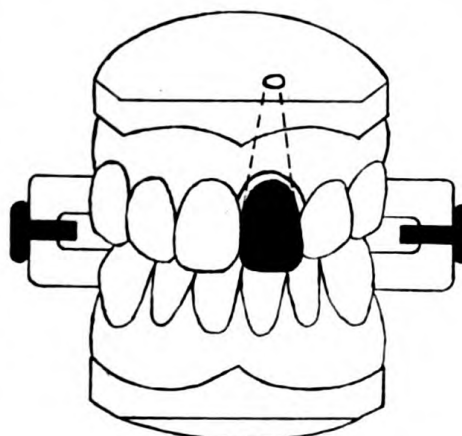


Figure 6.

6. Insert the die in the master model. Using inlay wax, carve the crown pattern on the die (fig. 6).

7. Remove the die and wax crown pattern together, from the model and invest them in the lower half of the flask. Use a mixture of half stone and half plaster for this investment. Imbed the lingual half of the crown pattern at a 45° angle, exposing the entire labial surface (fig. 6).

8. Lubricate the entire top surface of the lower half of the flask with a *thin* coat of vaseline. Pour the upper half of flask with a *vigorous* vibratory hand motion.

9. After the investment has set, separate the flask without heating. This is done in order not to mar the surface of the wax crown pattern until after the upper half of the investment has been checked for perfect duplication. Flush the wax first with boiling water, next with a few drops of carbon tetrachloride, and finally with boiling water again.

10. Paint one coat of a separating medium upon the hot investment, covering all surfaces exposed by the wax elimination. Allow from 15 to 20 minutes for hardening.

11. Flush the crown impression and the die with acrylic monomer. Sprinkle a gingival shade of acrylic powder in the impression and vibrate by hand. Building up the entire crown in the gingival shade by alternately adding powder, and *then liquid*, until all the powder has a wet appearance. Trial pack under wet cellophane.

12. Separate the flask after it has been pressed for 5 minutes. The cellophane is easily removed from the acrylic by slightly moistening it.

13. With a clean sharp cut, remove the middle and the incisal third portion of acrylic (fig. 7). (This is done only if two different shades are to be used; otherwise, only the incisal portion need be removed.) A scalpel with a No. 11 blade is the best instrument for cutting out the portion to be replaced with a different shade. Repack the removed portion of acrylic with the selected middle third shade and again make a trial pack under wet cellophane. Follow same procedure for the incisal shade. After the crown has been trial packed for the last time, trim any excess acrylic material with a scalpel and close the flask.

14. Place flask (locked in a spring press) in water at 160° F. for 30 minutes. Then raise the temperature of the water to 212° F. and boil for 30 minutes.

15. Allow the flask to bench-cool for 30 minutes.

16. Deflake the cured crown. Chip the stone from the crown with a spoon excavator. If the separating medium was properly applied,

the stone can be removed easily. Any residual stone can be removed by soaking the crown in a saturated aqueous solution of sodium citrate from 2 to 4 hours, then vigorously brushing the crown with a denture brush.

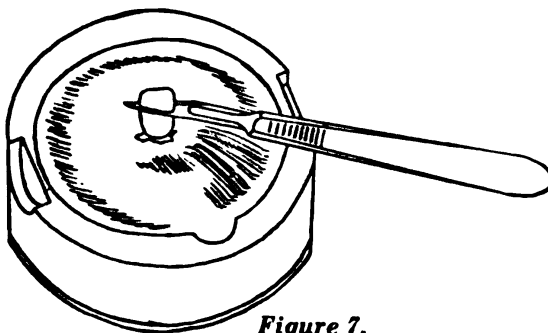


Figure 7.

17. Rough-finish the crown and soak it in water a few hours before trying it in the patient's mouth.

THE SECOND VISIT

1. Try the crown in the patient's mouth. Inspect for gingival fit, contour, shade, bite, contacts. Make any necessary adjustments in the mouth. Unlike a porcelain jacket crown, an acrylic jacket crown may be tapped lightly in order to perfectly seat it. The crown can be readily removed from the preparation by encircling it with a double strand of dental floss and giving it a slight jerk incisally.

2. Polish the crown on a lathe, using a soft white camel's hair wheel, flour of pumice, and gold rouge. A gentle touch is all that is necessary for a finely polished crown. The gold rouge can be washed off the crown with soap and water without affecting the polish.

3. Since various shades of zinc-oxyphosphate cements affect the esthetic quality of a crown, it is always best to first make a test mix with glycerin and try it in the crown. Since we have many shades of zinc-oxyphosphate cements, including gold, platinum, white, and yellow, a trial and error method with different combinations of these shades will produce the desired results. Cement the crown in place after the correct blend of cement has been selected.



FISTULA IN ANO OF A THREE-AND-ONE-HALF-MONTH-OLD INFANT

Report of a Case

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and

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REPORTS in the surgical and pediatric literature on cases of fistula in ano in children, and especially in infants, are rare. For this reason the writers wish to report a case in a 3½-month-old infant of whom the diagnosis of fistula in ano was established and the lesions corrected by surgery.

CASE REPORT

A 3½-month-old male infant was seen on 29 January 1946 in the pediatric clinic. A pustule near the right margin of the anus was noted but little attention was paid to it at that time except to treat it with a local application of sulfathiazole ointment and to suggest hot packs or sitz baths. On the next monthly check-up, 13 March, the lesion was still present and, according to the mother's story, had been draining pus since about a week following the last clinic visit. Further examination revealed a second pustule, nondraining, on the opposite anal orifice. A probe was introduced into the old lesion which proved to be a fistulous tract to the rectum superficial to the sphincter muscle. No attempt to pass a probe into the other suspected fistula was made in the clinic. The infant was admitted to the hospital for further study and surgery.

Past history.—The infant was born 12 October 1945. Weight at birth was 8 lb. and 3 oz. The mother, a primipara, had a short labor with a vertex presentation which required no forceps or episiotomy. Routine monthly check-ups in a pediatric clinic were carried out and the infant was circumcised on 20 November. No mention of any anal findings were noted until the clinic visit of 29 January and then the mother related that the first pustule had been present for about 1 week. The second one had appeared about 5 February.

Family history.—The mother had poliomyelitis at the age of 3 years, which resulted in residual paralysis and deformities of both forearms and hands. There is no history of tuberculosis, diabetes, or other familial diseases.

Physical examination.—Essentially negative except for the anal region which contained a fistula, opening 3 cm. from anal margin on the left side, and another opening on the right, about 2 cm. laterally from the anal margin. No evidence of hemorrhoids.

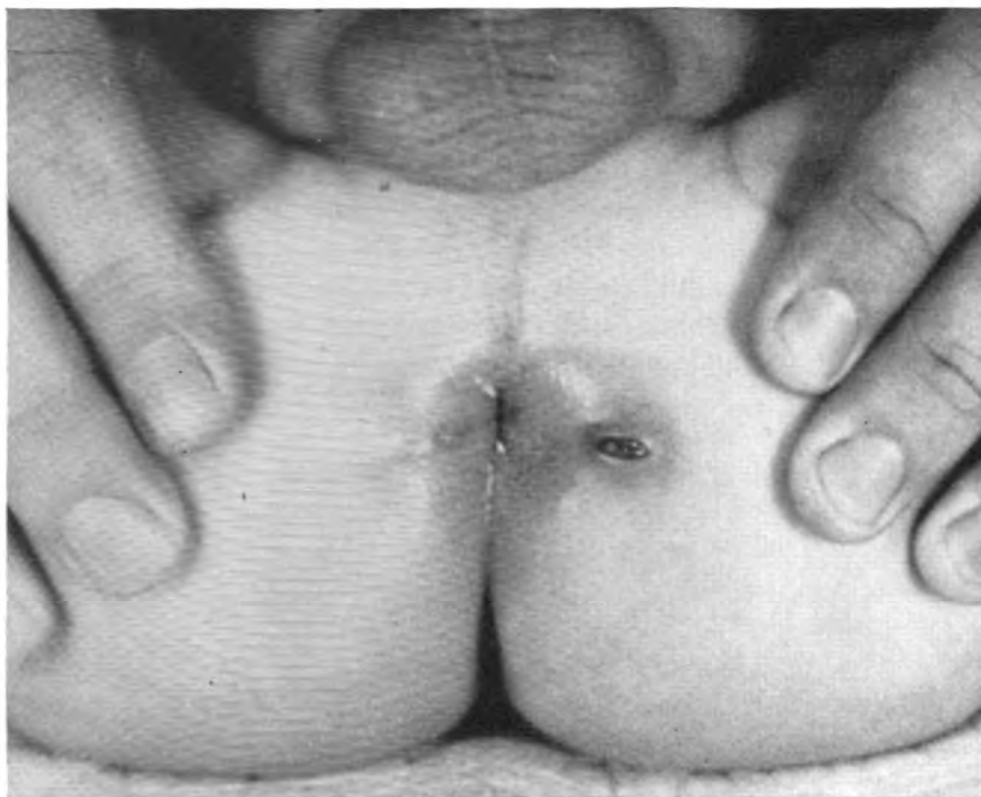


Figure 1.

Proctoscopic examination.—Revealed several deep crypts posteriorly and laterally. A probe passed through the fistula on the right into a right lateral crypt. The probe passed through the fistula on the left to the left lateral margin of the anus, but the primary opening in the skin was not identified.

Laboratory.—Blood and urine studies were normal.

Surgery.—Under drop ether anesthesia, surgery was undertaken on 15 March 1946. The fistula on the right was exteriorized throughout its entire length and was found superficial to the sphincter muscle. On the left, however, the fistula coursed deeper and through the substance of the external sphincter muscle. This tract was also exteriorized and the sphincter partially severed with a seton being placed about the remaining muscle fibers.

On 21 March an incision of all the remaining deep crypts was made and the muscle fibers held by the seton were severed.

Course.—The patient received hot sitz baths four times a day (temperature 120° for 15 minutes), and the anus was dilated at least three times a week. The wounds healed slowly by secondary intention, and the patient was discharged from the hospital healed on 6 April 1946.

DISCUSSION

In reviewing the literature, it was found that cases of fistula in ano in children are rare. Mitchiner's studies of 1,500 patients over a 10-year period, who were operated on for fistulas at St. Thomas Hos-

pital, London, found only 12 to be under 13 years of age. His youngest patient was a 10-week-old male infant. Bacon has reported one even younger, his being an infant 5 weeks old.

All fistulas described were preceded by abscess formation, which had their origin in an infection involving a crypt of Morgagni near the ano rectal line. Some cases were complicated by hemorrhoids and one case was said to have been congenital as no history of post-natal inflammation of the anal region could be obtained.

Mitchiner's 12 cases in children were all boys, and he was unable to explain why the male child is more prone to have fistulas than the female.

Symptoms are few and consist of (*a*) intermittent painful swelling, (*b*) purulent discharge, and (*c*) occasional blood-streaked stools. Diagnosis is based on the presence of an external opening in the skin near the anal orifice into which a probe may be passed to an internal opening.

Treatment is always surgical. A complete excision of the tract should be made. Hemorrhoids, since they are a source of perirectal infection, should be removed early as a prophylactic measure against fistula in ano.

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VOLVULUS OF THE SIGMOID COLON

Report of a Case

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VOLVULUS is an abnormal rotation or torsion of the intestine sometimes associated with knotting of intestinal loops and with partial or complete intestinal obstruction. Statistics indicate that 2 to 4 percent of all bowel obstructions are due to volvulus. In the United States volvulus of the sigmoid colon is a relatively uncommon condition. In eastern Europe, on the other hand, the condition is much more common and is a relatively frequent cause of intestinal obstruction. The higher proportion of cases in Europe may be attributable to the preponderance of coarse or bulky foods in the diet.

Volvulus may occur at any age, is more frequent in the male, and is often associated with dolichocolon. Some authors consider that the greatest incidence occurs in those of middle and advanced years. Volvulus of the sigmoid colon is particularly likely to occur if the sigmoid colon is dilated, elongated, and redundant. Such changes may be congenital or may be the result of chronic constipation and bowel stasis which predispose to lengthening and a simultaneous increase in the caliber of the gut. Fecal or pelvic masses may produce volvulus because their weight causes the heavier loops of intestines to sag and so obstruct a relatively empty section of bowel. Also, a short mesentery may produce a sharp angulation of an intestinal loop and thus predispose to volvulus. Similarly adhesions in the sigmoid colon may produce volvulus. Increased peristaltic activity as a result of diet or drugs also may be a factor.

Volvulus may involve a single area or sometimes two areas. The rotation is most frequently clockwise. Permanent or complete obstruction does not always occur and spontaneous detorsion may result. To support this fact, some patients may give a history of repeated acute episodes extending over long periods, the attacks subsiding under rest and conservative therapy. These acute episodes may do harm in that adhesions may form, or shortening of the mesentery may

result, or both. These are important factors in the eventual production of an irreversible volvulus.

Some authors subdivide the cases into acute and subacute groups. The acute cases usually occur in the younger age groups. The history of onset is short, there is an equivocal history of constipation, early transient emesis, generalized cramping abdominal pains, abdominal tenderness, acute distention, and marked prostration. Gangrene is an early development in this group and the course is fulminating. In some series, the subacute cases predominate; these occur in the older age groups. There is a more gradual onset of symptoms and a history of previous attacks. Constipation and emesis occur late in the course of the disease. Gangrene, if it occurs, is a late development and the course is moderate.

Patients may present a long antecedent history of constipation with repeated attacks of abdominal pain of varying severity. These minor episodes may be assumed to have been due to recurrent mild torsions which underwent spontaneous detorsion. Other patients may have had no such previous episodes. A history of dietary indiscretions or the ingestion of a purgative drug may be elicited occasionally.

Constipation is usually noted. In one series 76 percent of the patients were unable to retain an enema of more than 500 cc. of water. (The normal colon will retain 2 to 3 liters of water.) This fact, namely the inability to introduce 500 cc. of a tap water retention enema, was considered of diagnostic value in volvulus of the sigmoid colon. However, the obstruction must be complete for this sign to be positive, for if it is incomplete, 3 liters of water may be introduced into the redundant sigmoid loop. In the latter instance, the patient can expel only a small amount of the enema. A valvelike type of obstruction may occur which permits an enema to enter but not to be expelled.

Some patients may have diarrhea with blood and mucus in the stools; there may be little or no belching or flatus; vomiting seldom occurs and the patient may rapidly develop signs of collapse or shock. Treatment in these patients (cecostomy, intubation, and similar palliative measures) seems to be of no avail.

Early the abdomen may be soft, but more commonly marked distention occurs. Tenderness may or may not be present, but usually develops in the early stages of strangulation or when peritonitis develops.

Rectal examination is of no value. Sigmoidoscopy may demonstrate a low-lying lesion, but this is rare.

The roentgen examination is the most helpful single aid in diagnosis. It should include fluoroscopy as well as roentgenographic studies in the erect, recumbent, and decubitus positions. Distended sigmoid loops may be seen quite clearly. If a closed loop has been formed, fluid levels may be visualized. Usually, however, survey roentgenograms

demonstrate only that obstruction is present and that possibly it is located distally. A roentgen study with barium enema is required for more precise information. Double contrast studies may be helpful but usually are not necessary.

The typical roentgenogram shows a tremendously dilated sigmoid loop situated in the right side of the abdomen, with moderate distention of the colon above the volvulus, and frequently an absence of a collection of fluid within the bowel; "ace of spades" appearance of the barium enema opacity; "corkscrew-like" arrangement of the mucosa at the site of the volvulus due to torsion, and a normal mucosal pattern in the sigmoid colon and rectum distal to the dilated loops. The "ace of spades" appearance of the enema and the "corkscrew-like" arrangement of the mucosa are reputed to be almost pathognomonic of volvulus of the sigmoid colon.

Surgery is indicated upon establishing the diagnosis. The high mortality sometimes reported in this condition may be attributable to the difficulty in establishing a diagnosis and to the fact that palliative procedures ordinarily used in the treatment of intestinal obstruction are of little or no avail and may result only in fatal delay. Therefore, prompt relief of such obstruction is essential to prevent strangulation and subsequent necrosis of the bowel, bowel hemorrhage, and shock. Possibly, exteriorization and second-stage resection give the best results.

The following case was observed in the U. S. Naval Hospital, Philadelphia, Pa., on 26 November 1946:

CASE REPORT

Complaint on admission.—J. C. S., a 23-year-old white male, was admitted with a chief complaint of abdominal pain. The onset occurred 4 days preceding admission with cramplike abdominal pain which was generalized and with some constipation. Vomiting for 2 days before admission prevented the ingestion of solid food, although liquids could be retained. The patient noticed gradual abdominal distention and had no bowel movements for 4 days. He had had no blood in his bowel movements preceding the onset of symptoms. He had had no chills or fever.

Past history.—A history was elicited of two similar previous attacks, the first of which occurred 2 years before while the patient was in the Army. At that time, he was hospitalized for 2 months and he stated that the final diagnosis was "bilocular stomach." The last attack occurred 1 year previously and lasted 3 days. The patient was hospitalized in a civilian hospital at that time and the acute episode was relieved completely by a simple tap-water enema. The present attack had been less severe than the previous ones and small amounts of flatus had been passed occasionally.

Physical examination.—The temperature was 99.2° F.; pulse, 68; respiration, 18 per minute; blood pressure, 120/80.

The chest was clear to percussion and auscultation although there was loss of liver dullness over the right lower thorax anteriorly. The abdomen was dis-

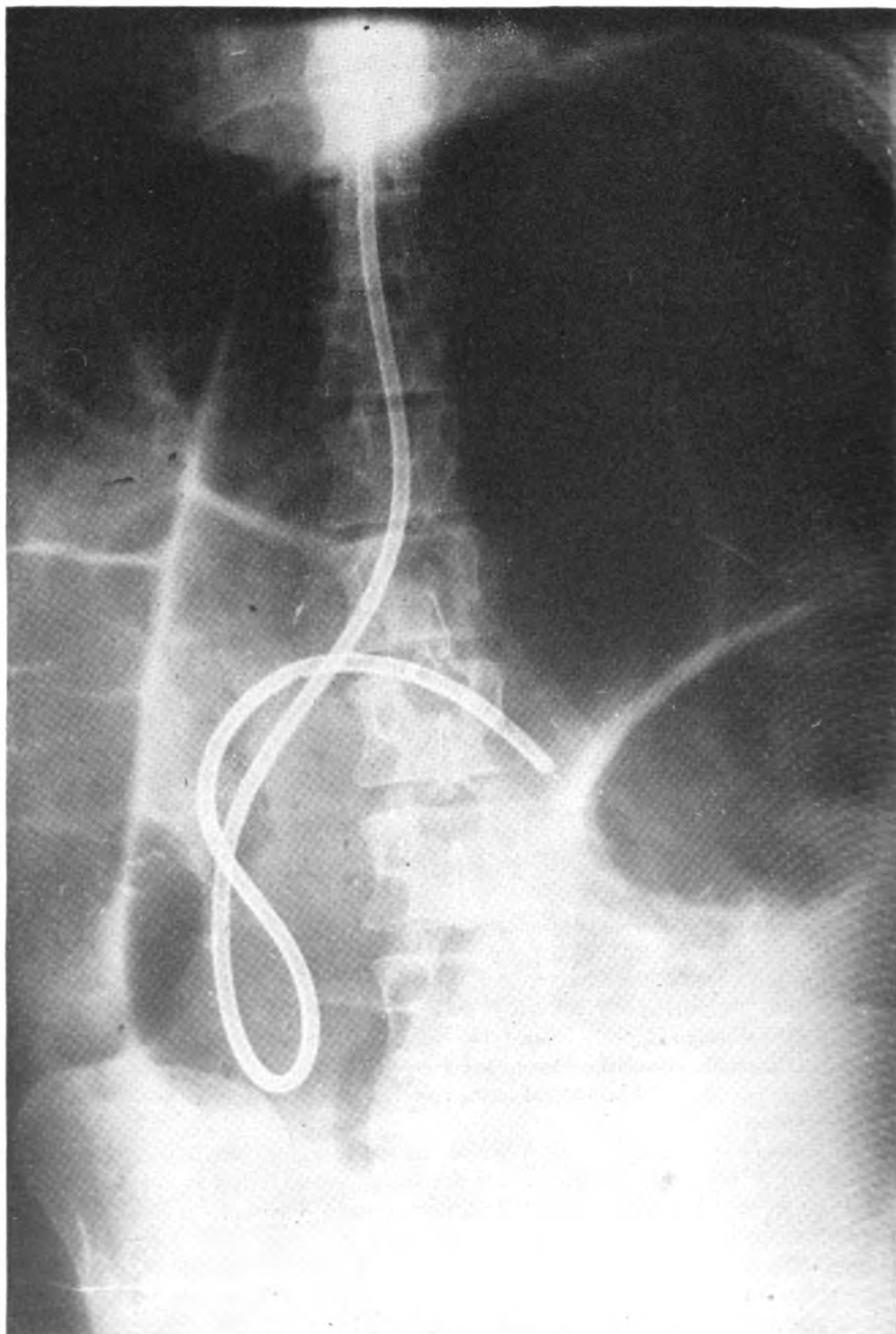


Figure 1.—Several loops of large intestine rather markedly distended with gas are distributed throughout the abdomen. A Levine tube lies coiled in the stomach.

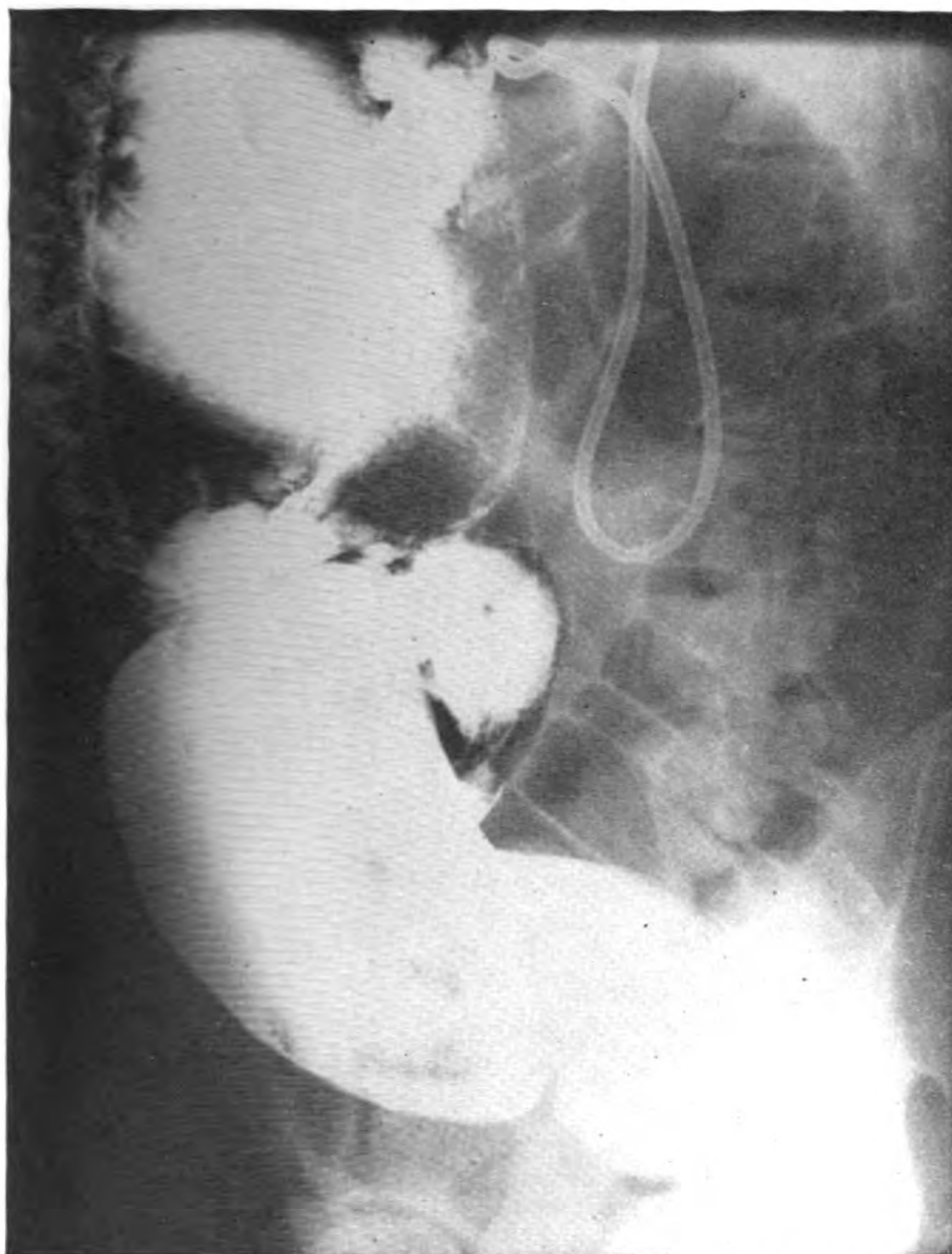


Figure 2.—Partial obstruction is seen in the midportion of a large redundant sigmoid colon. There is a rather typical "corkscrew" arrangement of the mucosa at the site of the volvulus.

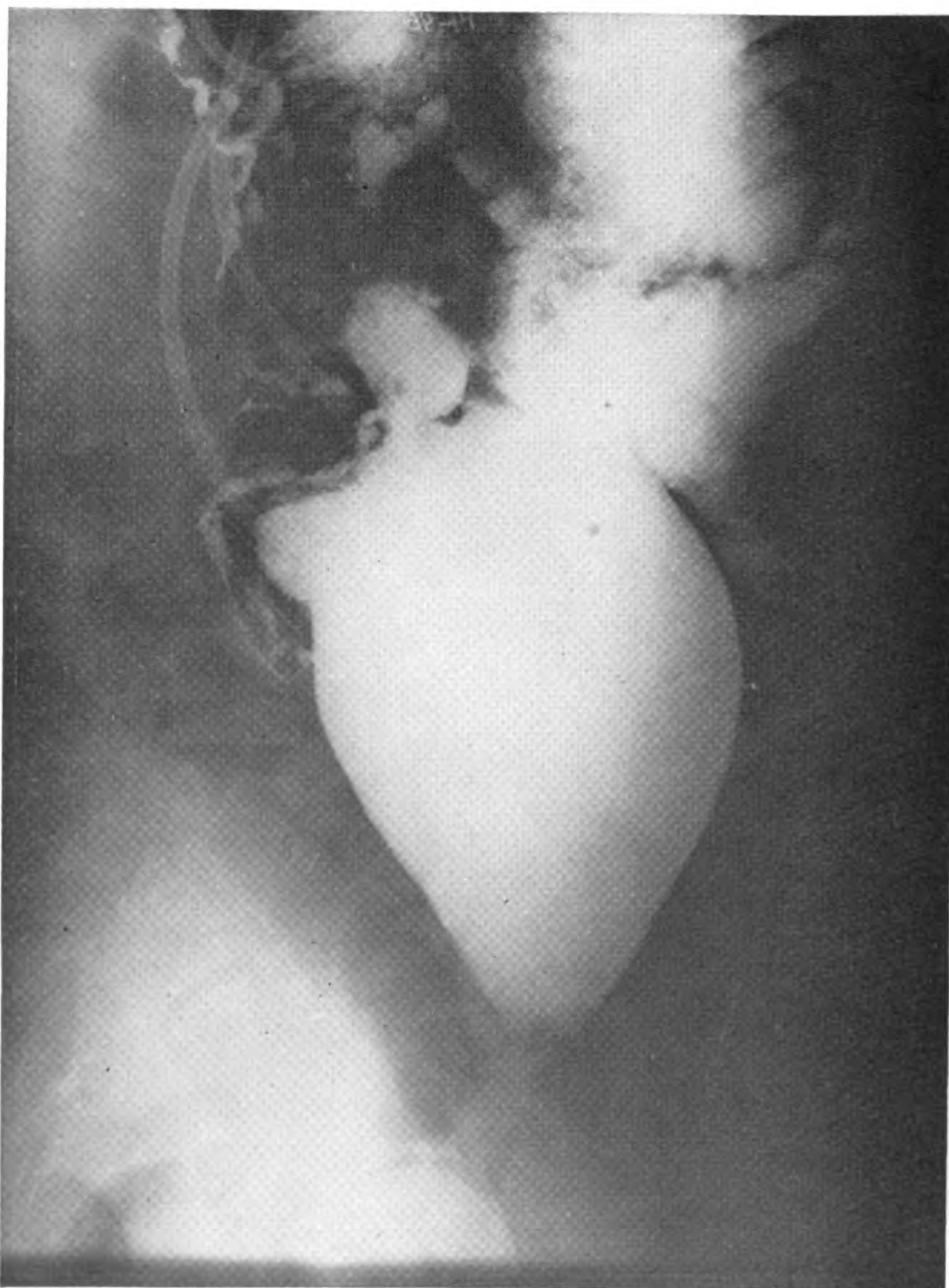


Figure 3.—Another projection of the area of partial obstruction due to volvulus of the sigmoid colon is somewhat suggestive of an “ace-of-spades” appearance of the barium enema opacity.



Figure 4.—Barium enema after the acute episode reveals an elongated, dilated sigmoid colon lying predominately in the right side of the abdomen. No evidence of volvulus or partial obstruction can be seen at this time.

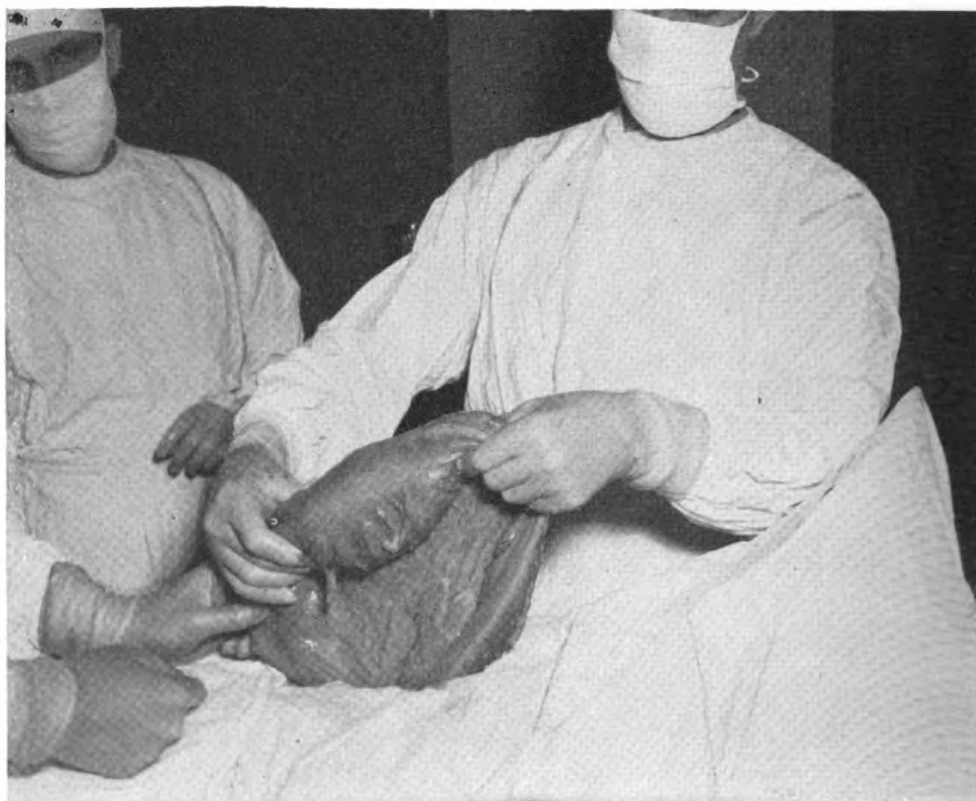


Figure 5.—Elongated and dilated sigmoid colon as seen at operation. Approximately 2 feet of this section of the colon were resected.

tended markedly, with an asymmetrical contour consisting of a prominence over the entire right side of the abdomen. This comprised a palpable longitudinal mass lying obliquely on the right side and extending from the hepatic area to below the umbilicus. Auscultation revealed high-pitched, tinkling peristalsis. No definite spasm or rebound tenderness could be elicited. There was slight costovertebral angle tenderness bilaterally. Rectal examination revealed no masses, impacted feces, or other significant abnormalities.

Laboratory findings.—Complete laboratory studies were all well within normal limits. Blood Kahn reaction was negative.

Clinical impression: Partial intestinal obstruction due either to a congenital anomaly, such as a band, or to a diverticulum.

A survey roentgenogram of the abdomen in the supine position with subsequent studies in the erect and decubitus positions showed dilated loops of large intestine lying mostly in the right side of the abdomen, suggestive of obstruction distally. There were no fluid levels (fig. 1). A barium enema on the day of admission revealed a large, dilated, redundant sigmoid colon lying in the right side of the abdomen. There was partial obstruction of this sigmoid loop with "corkscrew" and "ace of spades" deformities (figs. 2 and 3). The roentgenologic impression was possible volvulus of the sigmoid colon.

The patient's course under conservative and supportive therapy remained essentially unchanged for 2 days. On the third day after admission, however, he developed intense low-back pain. A rectal tube was inserted to a distance of 15 to 18 inches and a great quantity of gas under pressure was evacuated with



Figure 6.—*Postoperative barium enema shows the lateral anastomosis between the descending and sigmoid colons with a functioning stoma.*

about 300 cc. of fluid. Immediately, the distention was relieved completely. Then the patient became asymptomatic and remained so.

Another barium enema during this asymptomatic period revealed an elongated, dilated, and redundant sigmoid colon lying predominately in the right side of the abdomen (fig. 4). There was no evidence of volvulus or partial obstruction of the colon at this time.

Approximately 1 month after admission to the hospital, operation was performed. Through a low left rectus incision, the peritoneal cavity was opened. A long loop of sigmoid colon was found lying in the right half of the abdomen. It

was about 2.5 feet in length and was hypertrophied and dilated (fig. 5). About 2 feet of this section of the colon were resected. The ends were closed by three rows of sutures and a lateral anastomosis between the descending and sigmoid colons was made. Routinely the appendix was also removed. The abdomen was closed in layers without drainage.

The patient had an uneventful postoperative course and recovered completely in a fortnight. Then another barium enema revealed a functioning anastomotic stoma between the descending and sigmoid colons (fig. 6). There were no other significant abnormalities.

Therefore, there seemed to be little doubt that the elongated, dilated, sigmoid colon which was lying in the right half of the abdomen had caused partial intestinal obstruction by volvulus which underwent spontaneous detorsion following the insertion of a rectal tube.

SUMMARY

A case of volvulus of the sigmoid colon, which underwent spontaneous detorsion and which was later treated surgically, is reported. The etiology, pathogenesis, and treatment of such a condition are discussed briefly.

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THE MANAGEMENT OF COUGH

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COUGH is a symptom, and its management is largely determined by the physician's knowledge and familiarity with the pathology of the causative disease. Each physician has his pet remedy for colds; likewise, each one has his pet cough remedy and all too often fails to institute a diligent search for the real cause.

Boyd (1) has written an historical account of cough remedies, but lends little to the scientific approach to the problem of its management. In another article (2) he states that there is no advantage in combining a number of expectorants in a cough mixture.

Banyai (3) (4) (5) in his writings has contributed greatly to our knowledge of the physiologic factors involved in the cough mechanism. Only slight additions have been made to his excellent enumeration of these factors.

Cough is defined as a sudden violent expulsion of air after deep inspiration and closure of the glottis. This results in either harmful or helpful effects. The cause must be known in order to appraise the good or bad effects of the cough.

THE HELPFUL COUGH

The purpose of the helpful cough is the removal of:

1. Abnormal mucus.
2. Inflammatory products.
3. Foreign bodies.
4. Extravasated blood.
5. Products resulting from circulatory congestion.
6. All irritating sensations from the respiratory tree.

It is obvious that a great number of lesions and pathologic changes in the respiratory tree and elsewhere may cause coughing. The diagnosis of these lesions and pathologic changes is necessary to intelligently treat the cough. Expectoration is produced by:

1. The expulsive blast of air which carries the secretion from the larger bronchial tree, and
2. The parenchymal "tissue squeeze" as a result of the reduction of the chest space which compresses the lung.

A successful cough is one that produces effective drainage of the lung during an inflammatory disease without undue stress to any of the tissues of the body.

THE HARMFUL COUGH

Harmful coughing is produced by:

1. Stimulation of the cough reflex by extra pulmonary irritation from (*a*) the paranasal sinuses; (*b*) an elongated uvula; and (*c*) pressure on the trachea or bronchi by mediastinal inflammation, tumors, or dilated blood vessels.
2. Noninflammatory lesions of the bronchial tree (such as benign or malignant tumors).
3. Inflammatory processes of the bronchi or the lung parenchyma without the formation of exudate, but with constant irritation of the cough centers (as in the dry cough of early acute bronchitis).
4. Mucopurulent or mucoid secretions resulting from inflammation of the bronchial tree that are too tenacious to be removed by cough (as in paroxysmal stage of whooping cough).
5. Transudation in the alveoli during heart failure.
6. Obstruction of the bronchial tree due to pathologic changes which cause retention of secretions and exudates distal to the obstruction.
7. Atelectasis, because the definition of cough cannot be fulfilled.
8. Emphysema as a result of (*a*) weakening and destruction of the elastic structures; (*b*) reduction of the intrapleural subatmospheric pressure; and (*c*) abnormally low position of the diaphragm.
9. Fatigue and exhaustion of the expiratory muscles (as in old tuberculosis and pulmonary fibrosis).
10. Psychogenic cough, as seen in the exhibitionist.

Harmful results of an ineffective cough in the presence of inflammatory exudation in the lungs, producing stagnation is shown by:

1. Complete bronchial obstruction followed by atelectasis.
2. Pathologic changes due to retained bacteria, with production of bronchiectasis or lung abscess.

An ineffective cough disturbs the rest of the patient, and especially deprives the lungs of needed rest. This is most marked in tuberculosis. Pulmonary hemorrhage, laryngitis, spontaneous pneumothorax, vomiting, loss of appetite, exhaustion, headaches, insomnia, elevation in temperature, marked dyspnea, cyanosis, thoracic pain, fracture of ribs, mediastinal emphysema, subcutaneous emphysema, subconjunctival hemorrhage, urinary incontinence, and to some extent, myocardial failure, are all sequellae of severe prolonged ineffective cough, especially in pulmonary tuberculosis.

To remove the maximum amount of sputum with the least frequent and most effortless cough is the prime purpose of successful management of cough.

ANATOMIC AND PHYSIOLOGIC FACTORS

Knowledge of the following facts will enable the physician to approach the problem of therapy with greater success.

1. Cough center is:
 - (a) Located in the medulla near the sensory vagus and vomiting center.
 - (b) Subject to peripheral and central stimuli.
 - (c) Depressed by alkaloids of opium, alcohol, and general anesthesia.
2. Cough is provoked by the stimulation of the sensory endings of the glossopharyngeal and vagus nerves.
 - (a) Some of the branches of the vagus nerve associated with cough are:

Arnold's branch to the ear. A rare cause of cough is affection of the external ear by such conditions as wax and eczema stimulating Arnold's branch of the vagus.

Pharyngeal branch.

Superior laryngeal branch—sensory—to the base of the tongue, larynx, etc., a most frequent source of cough, with or without visible changes.

Inferior laryngeal branch which is motor for the action of coughing and not a cause of cough, but is a cause of inefficiency and other peculiarities in the act of coughing.

Cardiac branches, which are indirect causes through circulatory failure.

Pulmonary branches which are concerned in the cough of gross pulmonary or pleural disease.

Esophageal and pericardial branches—may be causes, but rarely are.

Gastric branches—occasionally causing cough due to dyspepsia.

- (b) The irritants to which the surfaces of the distribution of these nerves are exposed may be classified as:

Foreign bodies, e. g., dust, food, tobacco, smoke, etc.

Excess of natural secretion.

Pressure and inflammation.

Acute or chronic simple debility or increased irritability, e. g., after influenza, etc.

3. The secretory function of the glands of the bronchial mucosa is increased by stimulation of these vagal nerve endings.

4. Rhythmic relaxation and contraction of smooth muscles (which constitute one-half of the weight of the lungs) in the wall of the bronchioles is a normal process. Occlusion of the smaller branches of the bronchial tree is caused by spasm of these muscles. This may result from allergies and irritants, such as gases, fumes, and foreign bodies. It may lead to dyspnea, anoxemia, atelectasis, and increased cough.

5. Bronchi and bronchioles have peristaltic motion directed from the smaller structures toward the larger structures. It is independent of respiratory movement. Drugs of the parasympathomimetic group, which cause bronchospasm, also decrease or abolish bronchial peristalsis. Inhalation of carbon dioxide and oxygen in the proper mixture increases this peristaltic motion.

6. Cilia in larger and smaller bronchi normally drive inert material toward the larynx. Destruction of the sensory nerve endings of the vagus (by any pathologic process) destroys the ciliary function. Absence of the cilia, as in bronchiectasis, deprives the lung of this much needed help. Alkaline solutions stimulate ciliary motion.

7. The normal motion of bronchial secretions toward the larynx may be unfavorably influenced by drugs which change consistency or amount. Morphine suppresses normal bronchial secretions.

8. The amount of secretion expectorated is not a true index, because some of the secretion is resorbed, especially where it is thick or scanty. This is done by a process of digestion or dilution and liquifaction through the admixture of the secretions of the glands of the bronchial mucosa. This is true also of the alveoli (6). The resorptive capacity of the lungs can be effectively increased by ammonium chloride, potassium iodide, fluidextract of senega, fluidextract of ipecac, emetine hydrochloride, and oxygen under positive pressure.

9. The role of respiratory motion in the removal of inflammatory products from the bronchi is important. This rhythmically repeated motion tends mechanically to remove secretions. Shallow breathing decreases this aid; this may be found in:

- (a) Debilitated patients.
- (b) Effects of general anesthesia.
- (c) Depression of respiratory center by narcotics.
- (d) Anoxemia which may excite more vigorous breathing (7) (8) to be followed by greater depression of respiration.

The remedy consists of inhalations of carbon dioxide and oxygen and controlled respiratory exercises.

10. Secretions in the smaller bronchi do not produce effective cough. They are only effective in larger bronchi. Therefore a pathologic process localized in the bronchioles, such as in bronchiolitis, may cause respiratory distress, anoxemia, and cyanosis. In the absence of an

effective cough, therapeutic intervention is necessary for draining the small bronchi but must not increase the accumulation of exudate. Here again, carbon dioxide and oxygen is the best agent. This should be followed by graduated chest exercises.

Short inhalations of 5 to 10 percent carbon dioxide with oxygen are found to give the best results. There is an increase in:

- (a) Rate of respiration and volume of the lungs.
- (b) Ventricular output of heart.
- (c) Systolic and diastolic blood pressure.
- (d) Pulse rate and pulse pressure.

Contraindications for the use of carbon dioxide and oxygen are:

- (a) Recent pulmonary hemorrhage.
- (b) Marked emphysema.
- (c) Widespread pulmonary fibrosis without atelectasis, bronchiectasis, or mucopurulent retention in the air passages.
- (d) Acute plastic pleurisy and pleurisy with effusion.
- (e) Hypertension.
- (f) When the cause of the cough is outside the lungs.

A more modern classification has been formulated by Sollmann (9) and by Goodman and Gilman (10).

EXPECTORANTS

1. *Anodyne expectorants* depress the cough reflex by central action.

(a) Morphine alkaloids depress the irritative reflex and decrease the amount of bronchial secretions. Opiates are useful when the cough is dry and hacking, but are contraindicated when excessive mucous is present. Codeine, tincture opium, and pantopon are the most commonly used. Heroin should be avoided, because of its addicting properties.

(b) Peperidine (sedulon) depresses the medullary centers, especially the cough center.

2. *Sedative expectorants* tend to alleviate the inflammatory process in the respiratory tract by promoting the secretion of protective mucus, thus decreasing the frequency of paroxysms of cough. They are divided into three groups, each acting in a different way.

(a) Saline expectorants are believed to act reflexly, stimulating bronchial secretion through local gastric irritation, although their exact mode of action is not known. They are:

- (1) Ammonium chloride—for "tight" coughs.
- (2) Ammonium carbonate—for liquifying thick, purulent mucus.

(3) Iodides—increase bronchial secretions rendering them less viscid; used preferably in chronic cases to "loosen" the cough.

(4) Citrates and acetates of sodium and potassium or ammonium—used as expectorant drugs primarily on an empirical basis; their real action is in doubt.

(b) Nauseant expectorants increase the secretion and lessen the viscosity of bronchial mucus. In addition, they have a nauseant and emetic action which is chiefly central in origin. They are:

- (1) Syrup of ipecac.
- (2) Emetine.
- (3) Tartar emetic.
- (4) Apomorphine.
- (5) Salts of ammonium, especially the chlorides and carbonates.
- (6) Drugs acting through the saponins. These include squill, senega, quillaia, and grindelia.

(c) Demulcent expectorants diminish the tendency to coughing by a local, soothing effect on the inflamed mucosa of the pharynx. In this group are:

- (1) Syrup of acacia.
- (2) Licorice.
- (3) Glycerin.
- (4) Cane sugar.
- (5) "Cough drops."
- (6) Hot drinks.

3. *Stimulant expectorants*.—Some are mildly irritating in nature, but most of them will diminish bronchial secretion.

- (a) Creosotes (calcium creosotate and creosote carbonate).
- (b) Guaiacol.
- (c) Terpin hydrate.
- (d) Balsams of Tolu and Peru.
- (e) Pine tar.

To this classification should be added certain drugs described by Young (11).

1. Antispasmodic drugs (broncho-dilator or antispasmodic):

(a) Those which depress the vagal motor nerve endings and are, therefore, cholinergic:

- (1) Atropine.
- (2) Belladonna.
- (3) Stramonium.
- (4) Lobelia.
- (5) Hyocyamus.

(b) Those which stimulate the sympathetic inhibitory or dilator fibers and are, therefore, adrenagic.

- (1) Epinephrine.
- (2) Ephedrine.

(c) Dilates when it depresses the vagal ganglia: Nicotine.

(d) Those which dilate by direct action on muscle:

- (1) Nitrites.
- (2) Papaverine.

2. Other measures that may be used to promote expectoration are:

(a) Strychnine hydrochloride or sulfate by hypodermic, given in grains $\frac{1}{30}$ every 4 to 6 hours, when increased cyanosis and anoxemia produce drowsiness or restlessness and an unwillingness to cough.

(b) Coramine and cardiazol (metrazol) given subcutaneously.

(c) Strong liniments or poultices.

(d) Heat and diathermy.

(e) Oxygen.

The use of antibiotics as an aerosol in the presence of pulmonary infection is well known and is very effective in allaying a cough due to this cause. Three conditions must be met to bring about the most successful results: (a) The aerosol particles must be 1 micron in diameter or less; (b) aerosol must be given several times each day; and (c) the antibiotic should be given intramuscularly each day. It is believed that the use of $\frac{1}{2}$ cc. of epinephrine to aerosol (certain conditions excepted) adds materially to the success of the treatment.

Installation of oil, iodized oil, and oil combined with the sulfa drugs, and the antibiotics are used effectively in some instances. It has been argued that instillation of oil renders the cilia useless, and therefore should not be used. However, cough is less and an improvement in the symptoms occurs when used in instances such as bronchiectasis. The patient should be told that this method is a temporary measure and that the underlying cause will have to be cured by other means. The above-mentioned measure should always be followed by adequate and supervised postural drainage.

This article has presented information regarding the physiologic, and pharmacologic factors that are necessary in the management of cough. There are other factors of equal importance, such as (a) bronchoscopic drainage of the bronchial tree with the local application of medication; (b) high voltage roentgen therapy; (c) new drugs (such as derivatives of piperidine and dihydrocodeinone) (12); and (d) living and working conditions.

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USE OF BENADRYL IN HISTAMINE HEADACHE

Report of a Case

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HISTAMINE headache, histamine cephalalgia, or Horton's syndrome, is a form of headache which was first described by Horton, MacLean, and Craig (1) in 1939, and has since been reported on several occasions by other investigators. It is classical in its symptoms and is unique in its response to histamine.

The syndrome is characterized by a unilateral headache of short duration, persisting usually from 1 to several hours. The pain involves the eye, the side of the head, the face, and the neck—all in the distribution of the external carotid artery. There is swelling and lacrimation of the eye, with some photophobia, congestion, rhinorrhea, "stiffening" of the nostril, swelling of the temporal artery, and an increase of the surface temperature of the affected side of the face and temple. The headache is usually severe, and frequently of such severity as to cause the patient to contemplate suicide. The patient must remain in a sitting or standing position, the pain being more severe when lying down. The headache can be reproduced (2) by the subcutaneous injection of from 0.1 to 1.2 mg. of histamine, and attacks are frequently precipitated by alcohol.

The present accepted treatment consists of desensitization to histamine by the injection of gradually increasing doses of the drug.

Since the advent of the antihistaminic group of drugs, such as Benadryl and Antergan, many allergic states have been alleviated in degree. Since the syndrome under discussion seems to represent an abnormal sensitivity to histamine, a course of Benadryl was given in an attempt to relieve the headaches of a patient seen aboard ship.

CASE REPORT

J. W. S., a 25-year-old male, reported to sick bay for the first time on 9 February 1947, complaining of a severe unilateral headache.

He located the pain over the left frontal and temporal area, extending downward through the orbit, over the maxillary area, and down the left side of the neck. The pain was intense and was aggravated by a reclining position.

Physical examination at this time revealed the following: Temperature, pulse, and respiration were normal. Blood pressure 118/72. The face was flushed and perspiring on the left side of the midline; normal on the right. There was photophobia and increased lacrimation in the left eye. The left nasal passageway was markedly hyperemic and edematous. There was tenderness to palpation over the external carotid, the facial, and superficial temporal arteries; and these vessels seemed dilated and tortuous. The rest of the examination was essentially negative.

At this time codeine failed to give relief, and only partial relief was obtained following the administration of $\frac{1}{4}$ grain morphine.

Past history: Patient stated that he had been experiencing similar headaches intermittently since January 1945. Sometimes he had several in one day; sometimes there was an interval of several months between attacks. The headaches lasted 30 minutes to 2 hours, varied in severity, at times being so severe as to provoke him to contemplate suicide. None of the usual headache remedies had ever provided relief.

Course: On 11 February 1947, the patient received a subcutaneous injection of 0.6 mg. of histamine. This was followed in a short time by the onset of symptoms and signs similar in every respect to the headache which had occurred 2 days previously. He was unable to distinguish between the two. It was found further that the symptoms were relieved by the injection of epinephrine hydrochloride.

The diagnosis having been established, treatment with Benadryl was attempted on 13 February. Two hundred milligrams of Benadryl, in divided doses, were given daily for 3 days, during which time he experienced two typical headaches. On 16 February, dosage was increased to 400 mg. daily and continued for 2 weeks (until 2 March). During the 2-week period, the patient experienced five headaches, characteristic in all respects; two of them necessitated morphine for relief of pain. Accordingly, on 3 March it was decided that treatment had been unsuccessful, and the Benadryl was discontinued. On 5 March, desensitization with histamine was begun, and this was completed in 10 days.

The patient has been symptom-free since 8 March, has gained weight, and states that he never felt better in his life.

He was considered cured and returned to full duty.

COMMENT

An attempt was made to alleviate this syndrome by the use of Benadryl, the antihistamine effect of the drug clearly having been shown in other allergic states (3). The writer has no explanation to offer for its failure in this case; it is impractical to draw conclusions from a single case.

SUMMARY

A case of histamine headache in a 25-year-old man is reported. Therapy with Benadryl was used without success. Desensitization with histamine produced a cure.

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NEW PRESIDENT, ASSOCIATION OF MILITARY SURGEONS

Rear Admiral Joel T. Boone (MC) USN, General Inspector, Medical Department, U. S. Navy, has been elected President of the Association of Military Surgeons succeeding Brigadier General Edgar Erskine Hume, USA.



THROMBOCYTOPENIC PURPURA HEMORRHAGICA AFTER USE OF SEDORMID

Report of a Case

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THAT there is a definite casual relationship between secondary (symptomatic) thrombocytopenic purpura hemorrhagica and sedormid (allyl-isopropyl-acetyl-carbamide) has been recognized by the following observers: Loewy (1), Vogel (2), Boas and Erf (3), Kramer (4), Hoffman et al. (5), Moody (6), and Hill (7). The manifestations are an hemorrhagic diathesis; characterized by petechial and ecchymotic areas on the skin and mucous membrane; prolongation of the bleeding time and a reduction of the platelet count; and there may be associated anaphylactoid condition.

Thrombocytopenic purpura has been found in those patients manifesting an idiosyncrasy to sedormid. Loewy (1) states that the patient is susceptible because of gradual sensitization to the drug and believes it to be an allergic effect acting indirectly through its influence on protein metabolism. This sensitivity becomes apparent after prolonged use of the drug. The symptomatic manifestations disappear after the drug is discontinued only to develop if sedormid is again taken. Hoffman (5) has contributed this important observation: In all the cases reported, including their own (and to which may be added the case to be presented here), the patients had used the drug over a long period without untoward effect; all had stopped its use during a short interval before taking the one dose that immediately preceded the purpura. This suggests the development of an allergic sensitivity. Kracke (8) writes that this might be regarded as an allergic phenomenon because in some of the reports it has followed the administration of only small doses. Wiseman et al. (9) write: "The fact that the megakaryocyte in some instance does become hypersensitive to specific allergens, particularly to drugs, cannot be doubted." Squier (10) believes the same underlying allergic mechanism may be responsible for the thrombocytopenic purpura as well as for the recognized anaphylactoid type (Schönlein-Henoch). He further writes that in the latter, increased capillary permeability

is present alone or is the predominant manifestation; while in thrombocytopenic purpura depression of thrombocytes (platelets) also occurs as a part of an allergic response, as well as with an associated effect on the bleeding time. Fitz-Hugh (11) believes that the symptomatic complex of purpura may occasionally be traced to an allergic basis; stating that the mechanism of sequestration (and destruction) of platelets caused by some widespread alteration of reticulo-endothelium is of primary importance. In another case, brought to the writer's attention, in whom new hemorrhagic areas appeared after sedormid was given for diagnostic purposes following an interval to the previous use of this drug as a sedative, a biopsy of the skin was performed and the pathological diagnosis revealed an urticarial type of reaction with no histological evidence of purpura.

In reviewing the case reports of the previous authors in which a differential white blood count had been recorded the percentage of eosinophils varied, ranging from 0.4 percent to 27.8 percent. An associated eosinophil rise is not a part of the blood picture although it had been present in some of the cases (7 percent, 9.4 percent, 27.8 percent having been recorded, depending on the investigator). Vogel (2) found that the thrombocytolytic action may be very rapid; after the injection of the drug all the platelets had disappeared within 10 hours. As to the active agent causing this destruction Hoffman (5) points to the carbamide radical as being under suspicion, but the manner in which it acts is unknown.

CASE REPORT

L. B., male, 50 years of age, when first examined complained of having black and blue spots of 1 week's duration over his body. He had severe hematemesis on occasion, more especially in the morning. The vomitus was red to chocolate-brown in color. He had tarry stools and hematuria. There was no loss of weight but patient complained of weakness. He stated that he had been taking sedormid (0.26 gram) at night intermittently during the past year. He seldom included fruit in his diet. Familial and personal history of allergy or bleeding was negative.

Physical examination revealed that the patient was not acutely ill but he was somewhat asthenic. The head and neck were normal. The marginal gingivae were red and bled freely on pressure. The lungs were clear. The heart was normal. Blood pressure was 110 systolic; 70 diastolic. Pulse, respiration, and temperature were normal. The abdomen was soft. There was no enlargement of the liver, spleen, or lymph nodes. The extremities showed large, multiple, irregular-shaped areas of ecchymoses (ranging from deep purple to a light green) especially over the elbows and knees. Urinalysis showed a specific gravity 1.013, alkaline, albumen—trace. Microscopic examination revealed rare red blood cells. Formed elements and the differential count are given in tables 1 and 2. The blood Wassermann was negative and the blood serum icterus index was 7 units.

TABLE 1.—*Formed elements*

	Red blood cell count	Hemoglobin	Color index	Platelets	White blood cell count	Bleeding time ¹	Coagulation time (capillary method)
	<i>Millions</i>	<i>Grams</i>		<i>Thousands</i>		<i>Minutes</i>	<i>Minutes</i>
On admission.....	4.4	12.75	0.9	35	5,300	7	3.5
2 months later.....	4.0	13.90	1.03	200	8,300	2.5	7

¹ Normal 1-3.TABLE 2.—*Differential count*

	Banded forms	Segmented cells	Lymphocytes	Mono-nuclears	Eosinophils	Basophil
On admission.....	6	54	29	8	3	-----
2 months later.....	10	54	33	1	1	1

Four days later the patient still complained of continued weakness and sharp pains in joints of the shoulder and wrist. He had no longer any vomiting spells. Bowels were regular. The ecchymotic areas of elbow and knees had faded but new lesions were seen over the chest, forearm, and thigh. The gums had improved. A roentgenogram of the teeth follows: "From the standpoint of focal infection, the lower right, second molar and lower central teeth are considered. Osteoporosis of bone in upper left canine region is noted. Gingival examination of the interproximal spaces particularly disclosed slight areas of denuded mucosa. Six weeks later the areas of ecchymoses had disappeared." The patient was asymptomatic 2 months following his initial visit.

Treatment consisted of the immediate discontinuance of the drug as a sedative; an adequate diet with vitamin C and the use of preparations containing pectin. Vitamin K is apparently of no value as a nonspecific hemostatic. No other therapy was instituted.

COMMENT

Most of the postulates ascribed to Dr. R. A. Cooke to show this condition to be an allergic phenomenon have been demonstrated. A review of previously reported cases along with this report would seem to justify such a conclusion. No case of symptomatic thrombocytopenia, regardless of the degree of bleeding should be submitted to surgery. This is in contrast to the treatment of essential thrombocytopenic purpura where splenectomy is the only known measure that will restore the platelet level. Hence, the importance of careful study and correct diagnosis is paramount.

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OPTIC NEURITIS AND SINUSITIS

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THE coincidence of two diseases in a patient does not necessarily mean that there is a causal relationship between them. The wide diversity of opinion among experienced observers on the relative position of sinusitis as the cause of optic neuritis is a case in point.

The following instance of optic neuritis (papillitis) occurring in a patient with purulent sinusitis is reported.

CASE REPORT

M. H., a housewife, 41 years of age, was admitted to the hospital with the complaint of pain in left eye, especially on movement of eye, pain in region of maxillary sinuses, and blurring of vision in the left eye. Her temperature was 100° F. Present illness began 10 days before admission when she awakened in the morning having obstruction to nasal breathing with profuse drainage. The pain and blurring of vision developed on the third day after onset of illness. Treatment before admission to the hospital had consisted of nose drops and heat applied to the face and left eye.

Examination on admission disclosed a purulent infection of all the nasal accessory sinuses except the frontal sinuses, but the posterior ethmoids and sphenoids were those chiefly involved. The vision in the right eye was normal; in the left eye, 13/20. The central field was normal and the peripheral field showed a small concentric constriction. The disk was grayish white, had 1 to 2 diopters of swelling, and the margins were indistinct. The blood vessels and retina were normal in appearance. No hemorrhages, exudates, or other abnormalities noted.

Treatment consisted of penicillin, 30,000 units every 3 hours, sulfadiazine 1 gram every 3 hours, thiamine hydrochloride 25 mg. daily, and irrigations of sphenoid and maxillary sinuses.

The symptoms subsided promptly and on the fourth day of treatment vision in the left eye was 20/20, although the patient noted the letters to be fuzzy. Pain had subsided and the sinuses were clearing. Examination of the left eye with the ophthalmoscope showed no change from that noted on the original examination.

On the eleventh day of treatment the sinuses were clear, visual acuity and visual fields were normal, but the slight elevation of the nerve head persisted and did not subside until about 3 weeks later.

CASE REPORT

Although permanent good result is by no means certain, the immediate favorable course compares with that of another case (1) seen in 1932 in which recovery of vision has been lasting. In the latter case the optic neuritis was retrobulbar type instead of intraocular and there was restoration of normal visual function, except for a small scotoma for red and green around the blind spot that was still present on the last examination in 1937, and there had been no subjective visual disturbance or serious illness up to this time, a period of 15 years following relief from a purulent sphenoid and ethmoid infection.

The rarity of optic neuritis found in patients suffering from a purulent sinus infection prompts many observers to consider with a degree of skepticism the claim of a causal relationship between the two conditions or to ignore its possible existence. Not only is such doubt supported by the infrequent coincidence of the disease but also by the experience of many who have seen patients who were temporarily relieved of the visual disorder following operations on the sinuses and later discovered to have some other disease as the cause of the optic neuritis. Also, the occurrence of optic neuritis without any other demonstrable disease condition in many patients, and the tendency for recovery while receiving any one of a great variety of treatments, would seem to account for the confusing literature on the subject in recent years. These reports on optic neuritis and its relationship to sinusitis have been summarized (2) and disclose that several observers report the incidence of sinusitis as the cause of optic neuritis to be as high as 33 percent while some are of the opinion that no causal relationship exists.

It is clear that this disagreement occurs because of the diagnostic criteria for sinusitis used by several authors. These reports of high incidence of sinusitis as the cause of optic neuritis are misleading because the sinusitis as there represented is not the clearly defined infection with mucopurulent exudate, the criterion commonly used clinically as meaning sinusitis. Ordinarily, neither their clinical nor radiological findings on examination of the sinuses could justify such a positive diagnosis and the reports describe the patient as having a chronic hyperplastic sinusitis or congestive condition of the sinuses (3) (4). Cures have been reported, cited by Duke-Elder (2), even though examination of tissue removed on operation of the sinuses did not show any evidence of infection; with equal confidence good results were listed from use of local applications of ephedrine and also from the hyperemic effect of using iodine locally. Recovery from the visual defect cannot always be attributed to the treatment because remissions of the eye symptoms frequently occur in patients with multiple sclerosis, the most common cause of optic neuritis. The long-lasting

acceptance of the opinion that a considerable percentage of cases of optic neuritis is of indeterminable cause is not supported by the observations of Benedict (5) who reported the following causes for retrobulbar neuritis, in a series of 225 cases studied at the Mayo Clinic:

Multiple sclerosis.....	155
Pernicious anemia.....	14
Diabetes.....	14
Alcohol and tobacco.....	2
Syphilis.....	4
Congenital amblyopia.....	1
Familial cause.....	1
Sinus disease.....	1
Post-partum hemorrhage.....	1
Plumbism.....	2
Indeterminate cause.....	3

In patients with optic neuritis an examination of the nasal accessory sinuses should be included in the searching investigation made to determine the cause; and when a purulent sinusitis is present, curative therapeutic measures should be employed.

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VISUAL CORRECTIBILITY OF NAVAL RECRUITS

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IN THE physical examination of naval recruits, one of the most objective, accurate, readily obtainable, and important determinations is that of visual acuity. Theoretically, the candidate either can or cannot identify the prescribed test letters and thus his acuity either does or does not meet the established standard. However, this sharp demarcation between the fit and the unfit does not constantly exist in actual practice.

In the autumn of 1947, when enlistment acuity requirements were dropped to a minimum of 2/20 correctible to 20/20, a great increase was noted in the number of candidates referred to a naval hospital from a recruit training command for consultation concerning fitness for retention in the naval service. These men, although already sworn into the Navy at outlying recruiting stations, were found on reexamination at the training center to be unable to meet 20/20 acuity standards, nor could their vision be improved to 20/20 by either the glasses they were using or by the pinhole disk.

THE PROBLEM

Of 24,441 men examined during the 6-month period from 1 December 1947, to 1 June 1948, 593 such naval recruits (all of whom had presumably passed their enlistment examinations) were culled from processing lines and referred to the hospital. On refraction the great majority of these could be fully corrected, but 43 were found to have uncorrectible and irreversible ocular impairment which required their being invalidated from the Navy. In addition, four others lost an average of 5 weeks of time while awaiting approval of waiver requests submitted from the hospital.

Upon collecting information concerning their original visual acuity examinations from the individual recruits, it became apparent that the various recruiting medical officers were without adequate facilities for routinely determining maximum actual correctibility. They seemed to be groping for an answer to the question "How can we *know*

whether a man's vision is correctible?" Therefore, some were referring candidates to optometrists for subjective refraction, some were requesting statements of correctibility from the family physician, some were merely listing the visual acuity as found and noting it as correctible to 20/20, while some few had apparently despaired of the problem and seemed to be listing the unaided visual acuity of all comers as 20/20. Because the result of this lack of positive approach has been that men already enlisted must be later invalided from the Navy through hospitals rather than merely rejected at the recruiting station, it has detracted from efficiency.

It was decided, therefore, to attempt to analyze the problem with an aim toward developing, if possible, a method by which the factor of correctibility could be more objectively evaluated by the use of an instrument on hand in any recruiting activity, namely, the ophthalmoscope.

OBJECTIVES

The aim was to determine with what success any medical officer might be able to perform a subjective eye refraction with only the spherical lenses of an ophthalmoscope to serve as his trial case. The Manual of the Medical Department suggests the use of minus spheres in the ophthalmoscope to allow estimation of the degree of correctibility of patients with mild simple myopia,¹ but no emphasis has been placed upon the more involved refractive errors of other types.

Therefore, it was decided to measure the ophthalmoscopic spherical correctibility of patients with diverse refractive errors and to discover if, in the same individuals, correlation with complete retinoscopic findings might exist with any degree of constancy. It was frankly realized from the outset that astigmatism would not be amenable to complete correction because of the absence of the cylinders so necessary in such cases.

It is known that a "spherical equivalent" exists for every spherocylindrical combination. This is the sphere which represents a strength halfway between that of its two dissimilar meridians. When this sphere is found, it focuses a single point into an image which, although blurred, is only blurred into the smallest circular image which the distorted eye can project toward its retina. The principle of spherical refraction is widely used in somewhat more precise manner by various optometrists and it regularly satisfies those thousands of people who select their glasses by trying on successively stronger concave or convex spherical lenses at the counters of the nation's "dime stores." In seeking to find the spherical equivalent for any given

¹ Manual of the Medical Department, United States Navy, 1945. Paragraph 2124.5.

eye by using the ophthalmoscope, exactitude is hampered by the large gaps in lens power which exist between successive apertures around the hand wheel. The Welch-Allyn instrument is less objectionable than others in this respect because it moves by increments of only $\frac{1}{2}$ diopter in its lowest ranges.

METHOD

After the best unaided visual acuity was measured and recorded the patient was allowed to hold the unlighted ophthalmoscope before his eye (fig. 1) and to peer through the aperture while standing at the greatest distance at which he could only just read the 20/20 letters on the standard Navy cardboard chart. The unused eye was covered without pressure by an opaque occluder. With the setting at "zero" he derived a modified pinhole effect which excluded aberrant peripheral rays and increased the depth of focus. If this improved acuity, the patient was moved farther back from the chart until again barely able to discern the test letters. At this stage minus lenses (because much of the diminished acuity of the recruit age group results from nearsightedness, i. e., myopia) or plus lenses were rotated into position. With each change he was asked to answer the question, "Better



Figure 1.—The ophthalmoscope and occluder in use with standard chart shown in mirror reflection.

or worse?" As improvement resulted, stronger minus (concave) or plus (convex) sphere strength was added and he was repeatedly moved farther from the chart. When best acuity was obtained, the ophthalmoscope was moved slightly toward or away from the eye to approximate intermediate dioptric powers and the maximum benefit was thereby obtained. Using cut-out calendar numbers glued to the base-board at 2-foot intervals as space markers the distance in feet was noted and with this number as the numerator, placed over the denominator of 20, the best acuity was recorded. The process was repeated for the second eye, shifting test lines to avoid memory factors.

Following this "ophthalmoscopic spherical refraction," manifest and cycloplegic refraction was performed in the regular manner with spheres and cylinders combined as necessary to obtain the best possible acuity.

This procedure was performed in approximately one-fourth of the recruit disposition cases.

FINDINGS

Table 1 shows a representative example of various types of refractive deficiencies among those recruits who were found correctible to 20/20. The greatest proportion of these were due to myopia and this condition responded magically to minus spheres in the ophthalmoscope. In the other types of refractive errors it was found that if the ophthalmoscope could improve the acuity beyond 13/20, complete cycloplegic refraction could raise it the remainder of the way to 20/20.

TABLE 1.—*Examples of correctible deficiencies showing correlation between ophthalmoscopic and cycloplegic refraction*

Case	Eye	Unaided acuity	Ophthalmoscope refraction		Cycloplegic refraction		Ultimate diagnosis
			Best sphere	Best acuity	Corrective lenses	Best acuity	
1. B.N.	R.	3/20	-5	20/20	-3.75 sph.	20/20	Simple myopia.
	L.	3/20	-5	20/20	-3.75 sph.	20/20	
2. R.C.	R.	10/20	-1	13/20	-3.00 ex 165.	20/20	Simple myopic astigmatism.
	L.	8/20	-2	16/20	-3.50 ex 15.	20/20	
3. D.H.	R.	7/20	-2	13/20	-0.50 sph. -2.00 ex 15.	20/20-1	Compound myopic astigmatism.
	L.	9/20	-2	15/20	-0.25 sph. -1.75 ex 165.	20/20	
4. A.L.	R.	13/20	-1	18/20	+1.00 sph. -1.00 ex 5.	20/20	Simple hyperopic astigmatism.
	L.	12/20	0	18/20	+1.00 sph. -1.00 ex 5.	20/20	
5. T.L.	R.	10/20	+1.5	15/20	+5.00 sph. -1.50 ex 170.	20/20+3	Compound hyperopic astigmatism.
	L.	6/20	+1	13/20	+5.25 sph. -2.75 ex 20.	20/20+3	
6. A.H.	R.	5/20	-2	13/20-	+1.00 sph. -2.25 ex 5.	20/20-1	Mixed astigmatism.
	L.	8/20	-1	13/20-	+1.25 sph. -2.00 ex 10.	20/20-1	
7. C.D.	R.	20/20	0	20/20	+1.75 sph. -0.50 ex 75.	20/20	Anisometropic compound hyperopic astigmatism.
	L.	11/20	+3	17/20	+4.75 sph. -0.75 ex 170.	20/20-1	

Table 2 abstracts representative cases found incapable of full correctibility because of permanent deficiencies. In most of the cases

where a single eye was affected, the cause was amblyopia ex anopsia (from long-standing uncorrected hyperopia, astigmatism, anisometropia or squint) or, less often, disease of the various tunics of the eye. In some few of this latter type, especially when the eyes showed ocular pathology such as corneal opacification and fundus disease without gross refractive errors, ophthalmoscopic refraction might approximate the border-line of 13/20 (case 4, table 2). These cases were rare, however, and in them the underlying pathologic condition became readily apparent on examination.

TABLE 2.—*Examples of noncorrectible deficiencies illustrating information obtainable through ophthalmoscopic refraction*

Case	Eye	Unaided acuity	Ophthalmoscope refraction		Cycloplegic refraction		Ultimate diagnosis
			Best lens	Best acuity	Lenses	Acuity	
1. J.M.	{ R. L.	{ 4/20 20/20	{ +1 Plano	{ 5/20 20/20	{ +4.00 sph.—1.00 cx 90. +0.75 sph.....	{ 7/20 20/20	R. E. amblyopia ex anopsia from uncorrected anisometropia.
2. H.M.	{ R. L.	{ 3/20 20/20	{ +.50 Plano	{ 7/20 20/20	{ +2.00 sl.—4.50 cx 35. +1.25 sl.—25 cx 25.....	{ 13/20 20/20	R. E. amblyopia ex anopsia from uncorrected anisometropia astigmatism.
3. S.C.	{ R. L.	{ 2/20 16/20	{ +2. +0.50	{ 2/20 20/20—1	{ +4.75 sph—1.50 cx 180. +3.00 sph—1.00 cx 165.....	{ 2/20 20/15	Childhood squint from hyperopic astigmatism causing amblyopia ex anopsia R. E.
4. G.M.	{ R. L.	{ 8/20 7/20	{ +1.50 Plano	{ 13/20—1 10/20	{ +3.50 sph—1.00 cx 15. —0.50 sph—1.25 cx 170.....	{ 13/20+ 10/20	Bilateral syphilitic chorioiditis.
5. N.B.	{ R. L.	{ 20/20 Counts fingers	{ 0 0	{ 20/20 Counts fingers	{ +0.50 sph..... Cataract, no reflex.....	{ 20/20 Counts fingers	Cataract and blindness L. E. not noted on enlistment.

COMMENTS

1. Evaluating the correctibility of subnormal vision at recruiting stations is a challenging problem in the solution of which no procedure can replace a careful and inquisitive physical examination performed personally by the recruiting medical officer.

Used as herein described, the ophthalmoscope can be of considerable benefit toward reaching an accurate determination.

2. If the prospective recruit can be improved beyond 13/20 with the ophthalmoscope, it is highly probable that he can be corrected to 20/20 by cycloplegic refraction.

3. If the applicant cannot be improved to at least 13/20 by the pinhole disk or by ophthalmoscopic refraction, no statements of civilian practitioners concerning full correctibility merit credence. In such cases the Navy's interests would best be served if enlistment were withheld until each such prospective recruit should have proved his correctibility by securing suitable glasses with which he might actually be tested.

4. Where simple methods fail to benefit deficient acuity readily, recruiting medical officers should bear in mind the possible presence of disqualifying permanent and uncorrectible visual defects, notably amblyopia ex anopsia, and especially so when marked subnormality is present in only a single eye.

5. If men with ophthalmologic or any other type of disqualifying physical defect appear especially desirable and acceptable, efficiency, economy, and morale factors would be appreciably enhanced by submitting a request for waiver from the recruiting office *before* enlistment without exception and in every instance.



SACRO-ILIAC DISARTICULATION (HEMIPELVECTOMY)

Report of a Case

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ACCORDING to Pack and Ehrich,¹ amputation through the sacro-iliac joint has been performed only 132 times during the past 50 years, and some of the operations were not complete. They added 7 cases to those previously reported. It seems appropriate, therefore, to report the following case.



Figure 1.

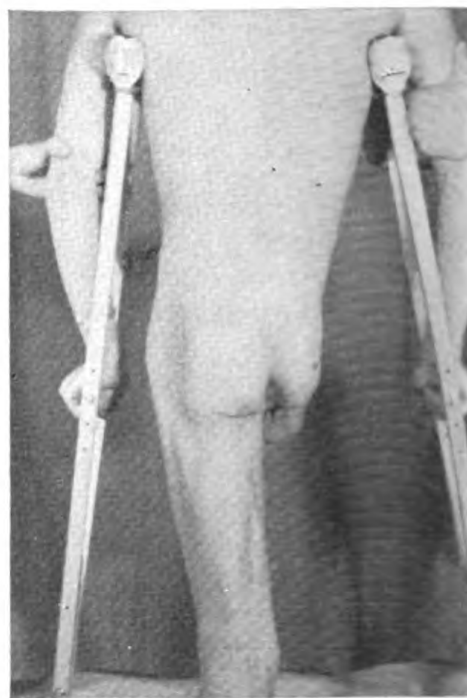


Figure 2.

¹ PACK, G. T., and EHRLICH, H. E.: Exarticulation of lower extremities for malignant tumors; hip joint disarticulation (with and without deep iliac dissection) and sacro-iliac disarticulation (hemipelvectomy). *Ann. Surg.* 124: 1 July 1946.

CASE REPORT

The patient, a 27-year-old white male, was admitted with a mass, associated with cramplike pains, in the right groin. The pains had been present intermittently for about 3 years. The mass, which had been noted for about 3 months, was about 3 inches in diameter and was tender, stony-hard, and immobile. There was increased temperature and redness of the skin over the mass.

On 7 February 1947 an exploratory operation was performed, and the tumor mass was found to be much larger than was apparent on physical examination. It was also found that it had infiltrated the quadriceps femoris muscles and the sartorius. Microscopic examination of excised tumor tissue revealed a highly malignant "undifferentiated" sarcoma.

A search for metastases revealed none. Roentgenograms on 6 February 1947 and on 25 February 1947 showed clear lung fields. After some delay in conference with the patient and his parents, it was agreed that a hemipelvectomy should be performed. A roentgenogram of the chest on 24 March 1947 was negative for metastasis.

On 25 March 1947 an exploratory abdominal operation was performed through a left paramedian incision at the level of the umbilicus. This was done in order

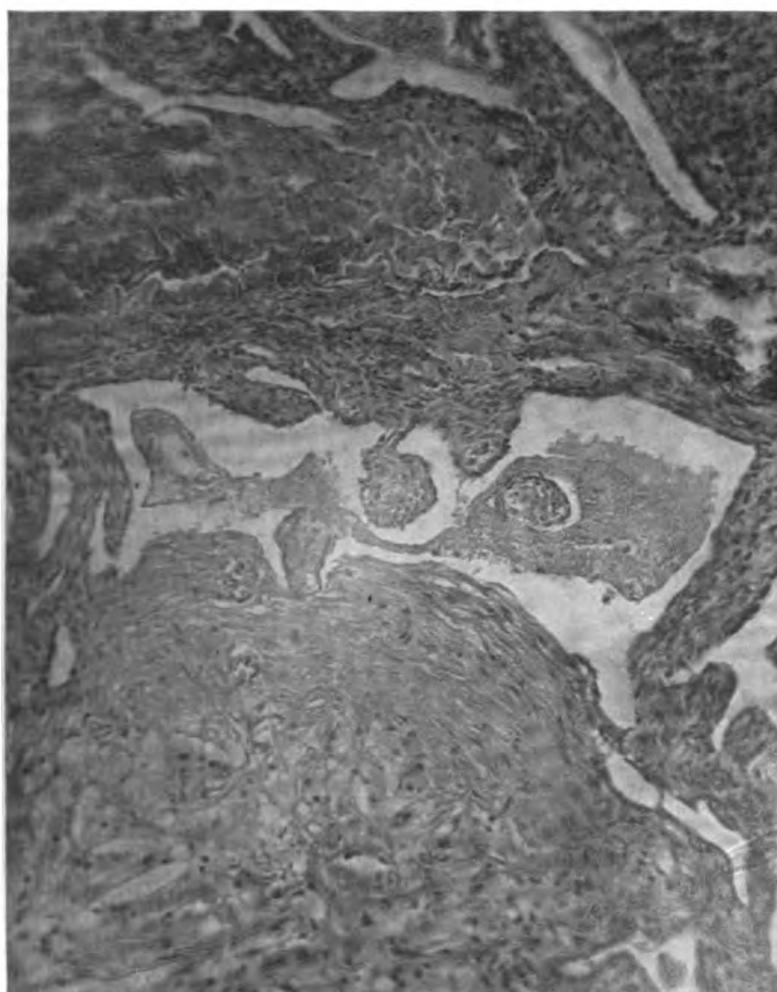


Figure 3.—Photomicrograph of synovioma.

to make sure that there were no gross metastases in the abdomen or the retro-peritoneal regions. No metastases were found. The incision was closed and a hemipelvectomy was performed according to the technique recommended by Pack and Ehrlich except that the common iliac artery was ligated instead of the external iliac artery. They ligated the common iliac artery in two of their seven cases but warned that necrosis of the skin flap might occur, stating that it had occurred in one of their cases. The operator decided to risk the possibility of necrosis of the skin flap by ligating the common iliac artery in order to obtain more complete hemostasis.

The patient's condition during the operation and immediate postoperative period was never critical. Considering the magnitude of the operation, the blood loss was comparatively small. On his return to the ward, his blood pressure dropped to 90/60 but responded promptly to infusions of plasma and whole blood. He made an excellent postoperative recovery. The wound healed by primary intention. The accompanying photographs (figs. 1 and 2) were taken on 10 April 1947, the sixteenth postoperative day. The pathologic report this time was synovioma. (See fig. 3.) This diagnosis has since been verified by several pathologists.

At the time of this writing (25 November 1947) the patient is alive, but his condition is not good. There are numerous large metastatic lesions in his lungs. It was realized from the beginning that a cure was highly improbable. However, it is our opinion that the palliation received by the patient during the past 7 months has justified the operation. He has had several months of freedom from pain and immobilization and was able to return to work at a desk job for a few months.



TRAUMATIC PNEUMOCEPHALUS

HERMAN A. GROSS

Captain (MC) U. S. N.

and

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TRAUMATIC pneumocephalus is a rare complication of head injuries and usually results from a fracture of the posterior wall of the frontal sinus or the cribriform plate. It can also follow basal fractures extending into any of the paranasal sinuses or mastoid cells. A fracture extending into a cranial sinus may be accompanied by a laceration of its dural covering which establishes a communication with the skull chamber. If the resulting dural fistula allows an exchange of spinal fluid and air, the latter may accumulate in the subdural, subarachnoid or ventricular spaces. Pneumocephalus usually follows craniotomy; the more unusual causes include intranasal or mastoid surgical procedures, chronic infections in the region of the cribriform plate, and downward extension of a pituitary neoplasm into the sphenoidal sinus. In persons with congenital arachnoid prolongation along the olfactory nerve, pneumocephalus may develop after a severe sneezing spell. Pneumocephalus may follow either an erosion of the frontoethmoidal region by an osteoma or erosion of the bones of the base of the skull by malignancy. Intracranial air follows gunshot or other penetrating wounds of the skull or can result from a compound skull fracture infected with gas-producing organisms.

CASE REPORT

A 31-year-old gunner's mate, first class, was admitted to the emergency ward at 0400 on 11 September 1946 following an altercation in which he received several blows on the head. A history of how the wounds were inflicted could not be obtained because of the patient's amnesia. Preliminary examination revealed ecchymosis and swelling about the right eye and a laceration of the upper lip. The patient continued vomiting through the night and by morning definite indications of increased intracranial pressure were apparent. He complained of occipital headache, showed some disorientation and could not remember the name of his ship or the details of his injury the previous night. His temperature was 102.6° F., the pulse was 92, and the respiration 22 per minute. The blood pressure was 155 systolic and 100 diastolic. His pupils were contracted and did not react to light; there was a sixth nerve palsy and impaired lateral conjugate

movements. Both nostrils contained dried blood, but there was no evidence of rhinorrhea or of blood or spinal fluid escaping from the ears or mouth. The right tympanum revealed a reddish-blue color and a loss of the light reflex. Similar, though less pronounced findings were observed in the left ear. No definite pyramidal signs were elicited.

The early treatment consisted of strict bed rest, intravenous fluids, sedation and careful nursing care including hourly determinations of the pulse, temperature and blood pressure. Although the patient still complained of rather severe occipital headache and was vomiting intermittently on the afternoon of 12 September 1946, his general condition permitted removal to the nearby x-ray department for radiographic examination of the skull. The radiograms taken at that time demonstrated the presence of intracranial air and the spontaneous ventriculogram shown in figures 1, 2, and 3. No fracture line was seen.

Because of the severe occipital pain a lumbar puncture was done in an attempt to alleviate the headache and also for diagnostic purpose. This was undertaken with precaution and revealed a xanthochromic fluid and a pressure of 490 millimeters of water. Compression of the right jugular vein increased the manometric reading to 610 millimeters of water and compression of the left jugular gave a reading of 630 millimeters of water. After slowly removing about 10 cubic centimeters of fluid the pressure fell to 230 millimeters of water. The immediate laboratory examination of the cerebrospinal fluid revealed: sugar, absent; protein, 100 milligrams per 100 cc.; chlorides, 550 milligrams per 100 cc.;

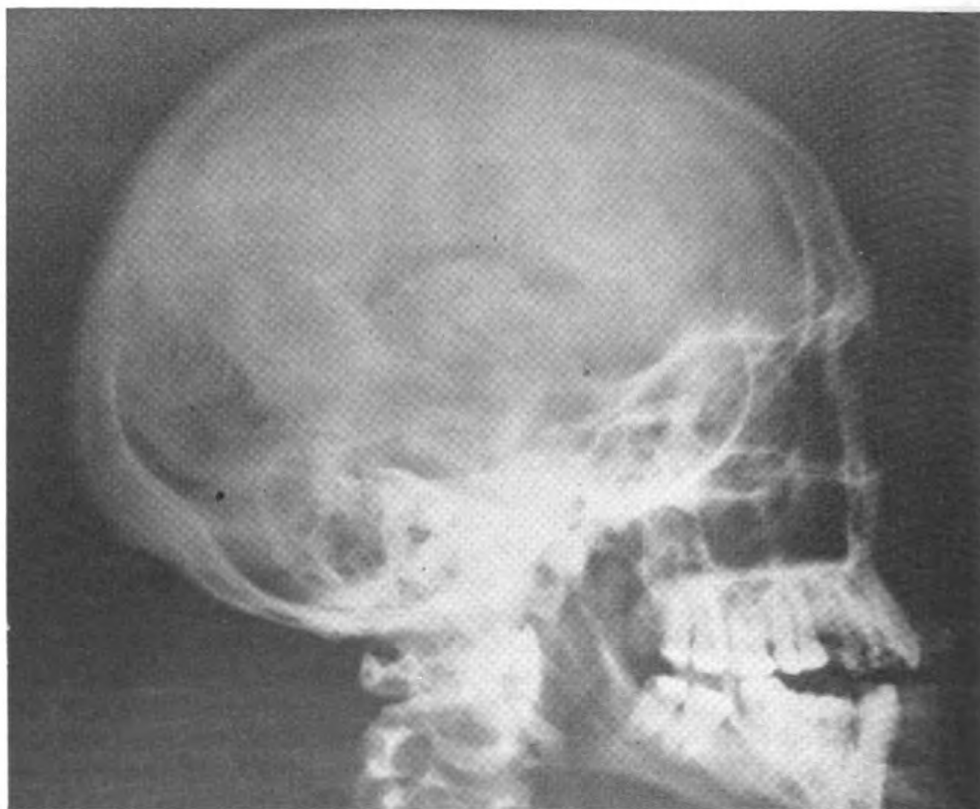


Figure 1.—A right lateral roentgenogram of the skull, taken 12 September 1946, showing the spontaneous ventriculogram and air outlining some of the subarachnoid pathways. No fracture line was identified.



Figure 2.—Left lateral roentgenogram showing findings similar to those in the right projection.

a positive pandy and a negative Kahn. The cell count showed 1,000 red blood cells and 7,000 white blood cells of which 82 percent were lymphocytes and 18 percent were polymorphonuclear leukocytes. The direct stained smear showed no organisms; a culture was made.

Because of the danger of meningitis from a compound skull fracture, which the presence of intracranial air indicated, the patient was given 30,000 units of penicillin intramuscularly every 3 hours. The general supportive treatment including intravenous fluids as indicated, sedation and careful nursing care were continued. During the night of 13 September he became steadily worse and lapsed into semiconsciousness and was nonresponsive to all but strong stimuli. The temperature was 105.6° F., the pulse 156 and the respiration 28 per minute. There was an absence of the abdominal and cremasteric reflexes and the deep reflexes were hypoactive but equal bilaterally. There were still no localizing signs.

A general improvement and return to consciousness followed the penicillin and supportive therapy. He was much improved by the morning of 15 September 1946. The cultures on the original spinal fluid examination were reported negative. Examination at that time revealed a temperature of 99.8° F., a blood pressure of 124 systolic and 92 diastolic, and the pulse was 104 and the respiration 17 per minute.

His condition remained satisfactory the following day; there was only slight elevation of the temperature, pulse, and respiration. On 16 September 1946 sulfadiazine was given orally in a dose of 1 gram every 4 hours. That night there was a rather sudden improvement in his general condition and by the following morning his headache had cleared. Slight stiffness of the neck and a residual left facial palsy persisted. The deep reflexes showed no abnormal changes.

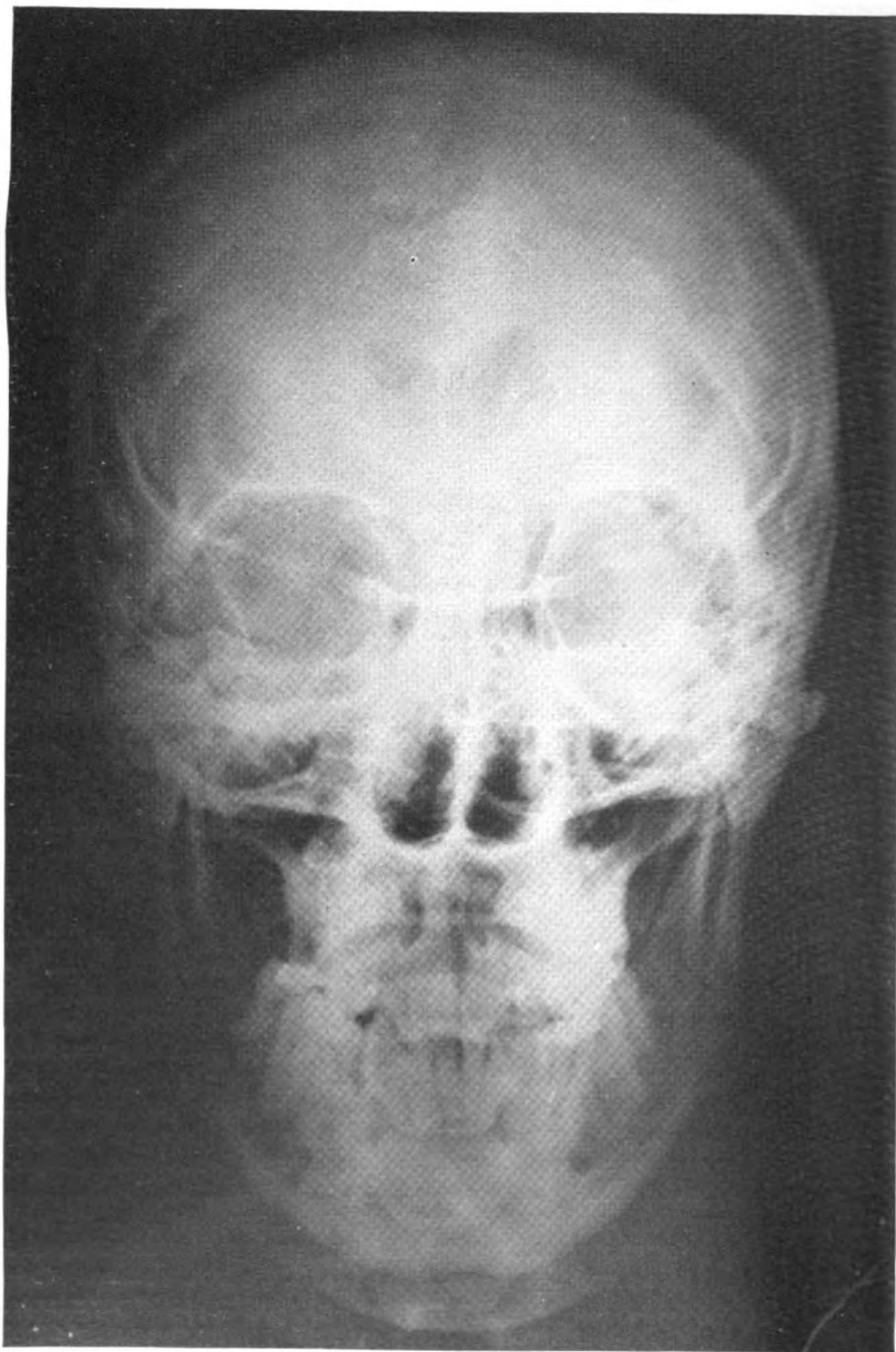


Figure 3.—Anteroposterior projection on 12 September showing the air in the lateral and third ventricles.

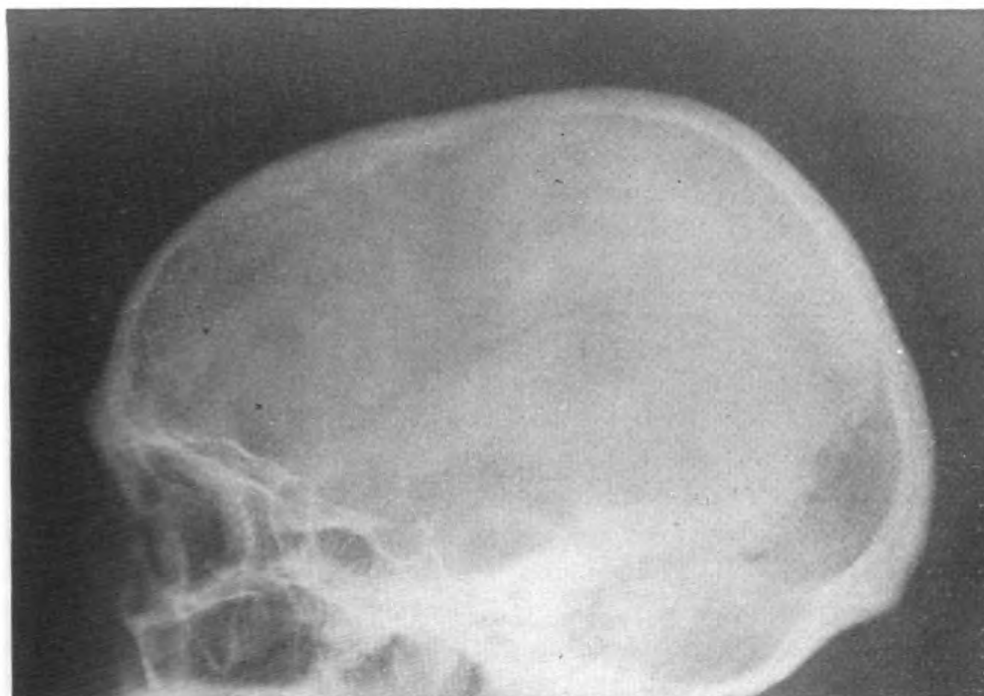


Figure 4.—*Lateral roentgenogram on 22 October 1946 showing complete absorption of the intraventricular and subarachoid collections of air. There was still no evidence of a fracture.*

Further improvement continued until 20 September 1946 when he sneezed twice. Soon thereafter he complained of severe occipital headache similar to that present on admission. Examination revealed a four plus nuchal rigidity and one plus Bruzinski. The patient remained well oriented but was quite drowsy. There were no localizing signs apparent, but sudden development of the clinical findings indicated a recurrence of his pneumocephalus, as a result of the sneezing. It was deemed inadvisable to move him for additional roentgenograms of the skull.

A lumbar puncture done the afternoon of 20 September 1946 revealed a clear fluid with a pressure of 600 millimeters of water. His headache was relieved following the withdrawal of about 10 cubic centimeters of cerebrospinal fluid for diagnostic purposes. Examination of the fluid revealed seven cells, all lymphocytes. Cultures were made.

On 21 September 1946 there was a slight elevation of the temperature but the blood pressure, pulse, and respiratory rate were within normal limits. General improvement continued and since he had been afebrile for 3 days the penicillin and sulfadiazine were discontinued on 24 September 1946. The red blood count on this date was 4.6 million; the white blood count, 6,750. The urinalysis was negative.

On 27 September 1946 the only abnormal finding was a residual left seventh nerve palsy, and by 17 October 1946 he recovered completely.

A follow-up roentgenogram of the skull on 22 October 1946 revealed that the intracranial air previously noted had completely absorbed. Again no fracture line was visualized. (See fig. 4.)

A complete physical examination made on 10 January 1947 revealed no abnormal physical or neurologic findings.

COMMENT AND DISCUSSION

This case was rather unusual in that the appearance of the intracranial air was seen quite soon after the head injury. Ordinarily traumatic pneumocephalus does not develop immediately. Ten days to three weeks may elapse before the condition progresses sufficiently to cause symptoms. Lewis reported intracranial aerocele noted at 3 months and at 30 months following initial injury. For this reason it is incumbent upon the surgeon and radiologist to be aware of such a sequela in any skull fracture which involves the cranial cells and to have follow-up roentgenograms in such cases in which pneumocephalus is likely to develop.

In cases of intradural air associated with head injury, repeated roentgenograms should be made if feasible to determine if the amount of air is increasing or diminishing. Because of the patient's condition it was not possible in this case to get skull roentgenograms at the time the clinical findings indicated a recurrence of the pneumocephalus.

The early symptoms of pneumocephalus are severe headache, drowsiness, dizziness, vomiting, and possibly diplopia, all due to sudden increase in intracranial tension. Choked disk may be found when the increased intracranial pressure has been present over a period of time. The only combination of symptoms definitely pathognomonic is the history of increased intracranial pressure and cranial trauma, followed by a sudden rhinorrhea brought on by sneezing. When stupor develops subsequently, as a result of head injury, the differential diagnosis lies between subdural hemorrhage, meningitis, abscess, and pneumocephalus.

The likelihood of meningitis developing after the accumulation of intracranial air is obvious. Before the advent of chemotherapy and antibiotics the mortality in pneumocephalus was as high as 40 to 50 percent. Infection or increased intracranial pressure were the causes of death. The prophylactic use of penicillin and sulfadiazine undoubtedly prevented the development of meningitis in this case.

If the site of the skull fracture is localized by the roentgenogram or by finding the source of the spinal fluid leak, craniotomy may be indicated to repair the dural fistula. A number of such cases have been reported but their discussion is not within the scope of this presentation.

Since the fracture line was not identified in this case, conservative treatment was followed and proved adequate. Because of the blood in the nose and the absence of a visible skull fracture on radiograms it was believed that the fracture involved the cribriform plate of the

ethmoid bone. The air probably entered a rent in the dura and gained access to the subarachnoid space, thence the basilar cisterns and into the ventricular system through the foramina of Luschka and Magendie.

CONCLUSION

Traumatic pneumocephalus is evidence of a compound skull fracture and indicates a fracture extending into a cranial air cavity, usually the posterior wall of the frontal sinus or the cribriform plate of the ethmoid. Roentgenograms of the skull should be made as early as feasible in cases of head injury and prophylactic therapy instituted promptly if pneumocranium is discovered or if the fracture communicates with any of the cranial sinuses. Follow-up skull roentgenograms should also be taken to determine if the air has diminished or increased.

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PERSISTENT URETHRAL FISTULA FOLLOWING CIRCUMCISION

Report of a Case

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THERE have been numerous instances of disability arising from improper methods of circumcision and in some cases the resultant deformity is far more disabling than that which circumcision was intended to correct. Too often this operation is assigned to inexperienced junior medical officers under inadequate supervision.

Mistakes are of various types. In some instances too much tissue has been removed, resulting in a tender and unsightly scar too far proximal to the glans penis and making sexual intercourse painful. In others, owing to the removal of too much tissue, a definite shortening of the frenum results from the plastic repair of the large tissue defect at this site. The frenal shortening, which may also ensue subsequent to the healing of an ulcer or abscess of the parafoveal region, often causes painful coitus, relative sterility or impotence, or painful incurvation of the phallus (chordee). Its correction by subsequent plastic procedure is often attended by considerable difficulty.

The routine employment of the guillotine method of circumcision, especially in infants, should be discouraged. Partial amputation of the glans penis has resulted from circumcision done by careless or inexperienced operators. This can be avoided by the preliminary retraction of the prepuce and the separation of adhesions between foreskin and glans, and in cases where this forcible retraction may not be accomplished, by the routine employment of the "dorsal slit" method of circumcision.

Conversely, instances of phallic deformity and sexual incapacity have resulted from the removal of too little preputial tissue. Patients have reported for the relief of painful erection and coitus because the operator failed to break up adhesions between glans and prepuce and to remove sufficient preputial tissue. The removal of only the redundant prepuce, leaving a cuff of foreskin tightly adherent to the corona glandis and proximal portion of the glans, gives rise to pain, tenderness, chronic inflammation, and resultant

sexual incapacity. Secondary plastic repair, with removal of the remaining portion of the prepuce, is necessary. This procedure, because of chronic inflammatory thickening of the tissues and formation of dense adhesions, is always more difficult than removal of an adequate amount of preputial tissue at the time of the original operation.

Failure to remove sufficient tissue in the region of the frenum has resulted in an unsightly mass of edematous, frequently chronically infected tissue. The persistence of this deformity renders coitus painful or impossible. The secondary removal of the chronically infected, edematous mass of tissue is attended by more bleeding and slower healing than was the original circumcision and the hospital stay is necessarily prolonged.

Secondary infection of circumcision wounds may result in extremely serious penile deformity, an outstanding example of which is herewith reported. As stated in the foregoing paragraph, serious infection in the region of the frenum may lead to a disabling deformity. Also, it may give rise to a much more serious complication: persistent urethral fistula.

CASE REPORT

On 11 February 1946 a radioman, second class, USNR, had a circumcision performed aboard ship by the "dorsal slit" method. Three days following operation, marked local edema and redness were noted. Five days after operation, several large sloughing ulcers along the line of sutures were seen, the largest of these occupying the region of the frenum. The ulcers became progressively larger and deeper despite local application of antiseptic solutions. Leakage of urine from the large ulcerative defect in the region of the frenum was noticed 2 weeks after circumcision.

On 13 March 1946 the patient was transferred to a naval hospital, where he was first seen by the writer. At that time there was generalized infection of the glans penis with brawny induration of the superficial tissues of the penile shaft. The circumcision line was largely unhealed and a heavy mucopurulent exudate was present. An ulcer, with ragged, sloping edges, about the size of a 10-cent piece occupied the site of the frenum. Three other crusted, ulcerative lesions occupied positions along the lateral and dorsal aspects of the circumcision line. When the patient voided, most of the urine passed through a urethral defect, 0.6 cm. long, which occupied the deepest portion of the ulcerative defect at the site of the frenum.

The infection was gradually controlled by the continuous application of 1:4,000 potassium permanganate solution dressings and the intramuscular administration of 500,000 Oxford units of penicillin. By 1 April all the ulcers were completely healed, but the fistulous opening in the terminal urethra persisted. This was 0.6 cm. long and was situated on the ventral surface of the penile shaft, 1.5 cm. proximal to the normal urethral meatus. An unsuccessful attempt was made to close the urethral defect by diverting the urinary stream through an indwelling catheter. On 16 April 1946, after a fortnight of continuous catheter drainage, suprapubic cystotomy was accomplished under spinal anesthesia.

Urine analysis and blood count were normal at the time of operation. The Kahn, Ducrey, and Frei tests were negative.

On 7 May, under spinal anesthesia, a successful closure of the urethral fistula, employing the method first described by David M. Davis in 1940 (1), was effected.

An incision surrounding the fistula was made, and the skin undermined. A straight needle, threaded with fine silk, was inserted, eye first, in the meatus and brought out through the fistula, one end of the thread remaining protruding from the urethral meatus. The cut edges of the fistula were then caught with the needle and thread (in a purse-string suture), which was then passed back through the meatus.

When traction was made on the two ends of the thread, the fistula was inverted and made to project into the lumen of the urethra. This inversion of the urethra was maintained by fastening the threads to a rubber band which was attached to the skin of the abdomen under slight tension. The subcutaneous tissues were approximated by interrupted sutures of OO plain catgut. One flap of skin was pulled as far as possible over the site of the fistula and the skin edges approximated with interrupted sutures of fine silk.

On the fifth postoperative day, the threads, by which inversion of the fistula was accomplished, pulled loose from the urethra. The postoperative course was entirely uneventful. Sutures were removed on the eighth postoperative day and a clean, granulating, superficial defect, 0.3 cm. in diameter, remained at the distal extremity of the operative wound. This was entirely healed, by second intention, at the end of 10 days.

The suprapubic drainage was maintained until 24 June, when urethral catheter drainage was instituted and the suprapubic defect allowed to close. On 29 June 1946 the urethral catheter was removed, the suprapubic defect being well-healed. The patient was able to void in a normal manner with no leakage or discomfort whatsoever.

On 4 July he was discharged to duty. The urethral fistula was well-healed, the tissues at the operative site were of healthy appearance, and he had no urologic symptoms.

SUMMARY AND COMMENT

The frequently performed and, unfortunately, lightly regarded operation of circumcision is not without serious complications. Neglect of necessary precautions as to asepsis, operative technique and post-operative care may result in permanent deformity and dysfunction. The successful repair of one of the most distressing sequelae, urethral fistula, has been described.

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MULTIPLE PRIMARY MALIGNANCIES ARISING IN THE RECTUM, BRAIN, AND THYROID

Report of a Case

HOWARD W. CRAIL

Lieutenant (MC) U. S. N. R. (Inactive)

The presence of multiple malignant tumors was first described by Bilioth (1) in 1879, and subsequently many isolated cases and several series of cases have been reported. In 1932, Warren and Gates (2) made an exhaustive study of this subject from the literature as well as reporting 40 cases of their own. They adopted the following criteria: "Each of the tumors must present a definite picture of malignancy, each must be distinct, and the probability of one being a metastasis of the other must be excluded." A case of primary multiple malignancies meeting these criteria is the subject of this report.

CASE REPORT

R. W. F., a 24-year-old white male, was admitted to the U. S. Naval Hospital, Bethesda, Md., 5 October 1945, complaining of double vision, headaches, a speech defect, vomiting, and a staggering gait.

Family history.—There was no history of chronic illness or malignancy. His parents and wife were living and well.

Past history.—A small lump in his neck just below the right thyroid cartilage had been present for 10 years; he thought it might have increased slightly during the previous year. An application for a flying license was refused in 1941 because of a mild ocular squint.

Present illness.—In April 1945, while at sea, the patient occasionally began to see two images and in July he began to experience severe generalized headaches. Shortly thereafter he noticed difficulty in expressing himself verbally, although he was well aware of what he wished to say. In August he had sudden attacks of projectile vomiting and an occasional generalized convulsive seizure. About the same time, he developed a staggering gait which was brought to his attention by his fellow officers. On 14 August the patient developed an acute pyelitis, which responded favorably to penicillin. The other symptoms were not reported and he was returned to duty after 2 days. Ten days later he was readmitted to the sick bay because of dizziness and weakness. A large rectal polyp was discovered upon routine examination. He had lost 15 pounds since the onset of his symptoms. Hospitalization for diagnosis and treatment was advised.

Physical examination.—The temperature, pulse rate, blood pressure, and the respiratory rate were normal. A firm, symmetrical tumor 2.5 cm. in diameter

seemed to be in the right lower lobe of the thyroid gland. There was no lymphadenopathy. The heart and lungs were normal. No abdominal masses were palpable and the liver, spleen, and kidneys were not felt. Digital examination of the rectum revealed several polypoid tumors. A proctoscopic examination of the rectum and lower sigmoid revealed 18 polyps ranging from 1 to 10.5 mm. The largest of these was removed for pathological examination.

Neurological examination.—The patient was confused as to time and place, but his speech was coherent and he had no aphasia. His senses of smell and taste were intact. The pupils were round, equal, and reacted to light and during accommodation; the visual fields were normal. There was a bilateral weakness of the external recti and of the right superior rectus muscle. A right lateral nystagmus was demonstrated. Fundusoscopic examination revealed bilateral papilledema measuring 4 diopters. Many small irregular hemorrhages were scattered over the disks and the veins were enlarged. The motions of the mandible were normal and the bite strong. No asymmetry of facial expressions was present. Hearing was very slightly diminished in the right ear but within the normal range. The uvula was in the midline. Deglutition was normal as were the movements of the head, neck, and shoulders. His voice was normal. The tongue deviated to the right on protrusion. The superficial and deep reflexes were all symmetrically diminished. The Babinski on the right was slightly positive; no other pathological reflexes were elicited. There was an asynergy of all the extremities, but more pronounced on the left and more in the left leg than in the left arm. He walked with a broad, ataxic gait of the cerebellar type with swaying to either side. Swaying in the Romberg position was present equally with the eyes opened or closed. Touch, pain, temperature, and vibratory sensations were everywhere normal.

Laboratory examinations.—Urinalysis revealed no sugar or albumin. The sediment contained a rare hyaline cast, 1 to 3 erythrocytes and an occasional leukocyte per highpower field. Blood studies, including red blood cell count, white blood cell count, and differential were normal; sedimentation rate, 9 mm. per hour (Cutler); bleeding time, 1.5 minutes (Duke); clotting time, 3 minutes (Lee and White). Total serum protein, 6.9 gm.; albumin, 4.3 gm.; and globulin, 2.6 gm. Kahn test, negative. Spinal fluid studies revealed an increased pressure; the fluid was grossly bloody and chemical studies were not made. The colloidal gold curve was normal and Kahn and Kolmer tests were negative.

Roentgenologic examination.—Roentgenograms of the chest revealed normal cardiac and lung shadows. The skull showed no evidence of an intracranial lesion. Normal renal shadows and kidney function were demonstrated by I. V. urograms.

Clinical course.—The patient's condition became rapidly worse with progressive signs of increasing intracranial pressure. On 16 October an exploratory operation was done opening the posterior cranial fossa. The brain herniated into the operative site and a large neoplasm occupying the vermis of the cerebellum and filling the fourth ventricle was removed. Following the operation, the patient remained unconscious with tachycardia and tachypnea, and he responded only to painful stimulation by moving his extremities, swallowing, and blinking. He died on 22 October, 6 days following the operation.

Pathologic examination.—Microscopic examination of the *rectal polyp* (fig. 1A) showed a papillary structure covered with tall columnar epithelium. The glandular elements extended into the stalk. The epithelium was crowded and lay back to back in many regions. The epithelial cells showed considerable variation in size and shape and their nuclei were spindle-shaped with infrequent mitoses.

A few plasma cells and lymphocytes infiltrated the stalk. The change of glandular architecture and cell structure plus their invasive pattern were diagnostic of adenocarcinoma of a rectal polyp.

The surgical specimen from the brain (fig. 1B) was solid, gray, gelatinous and contained no cystic formations. The sections showed densely packed spindle- and oval-shaped cells having hyperchromatic oval and round nuclei with scant

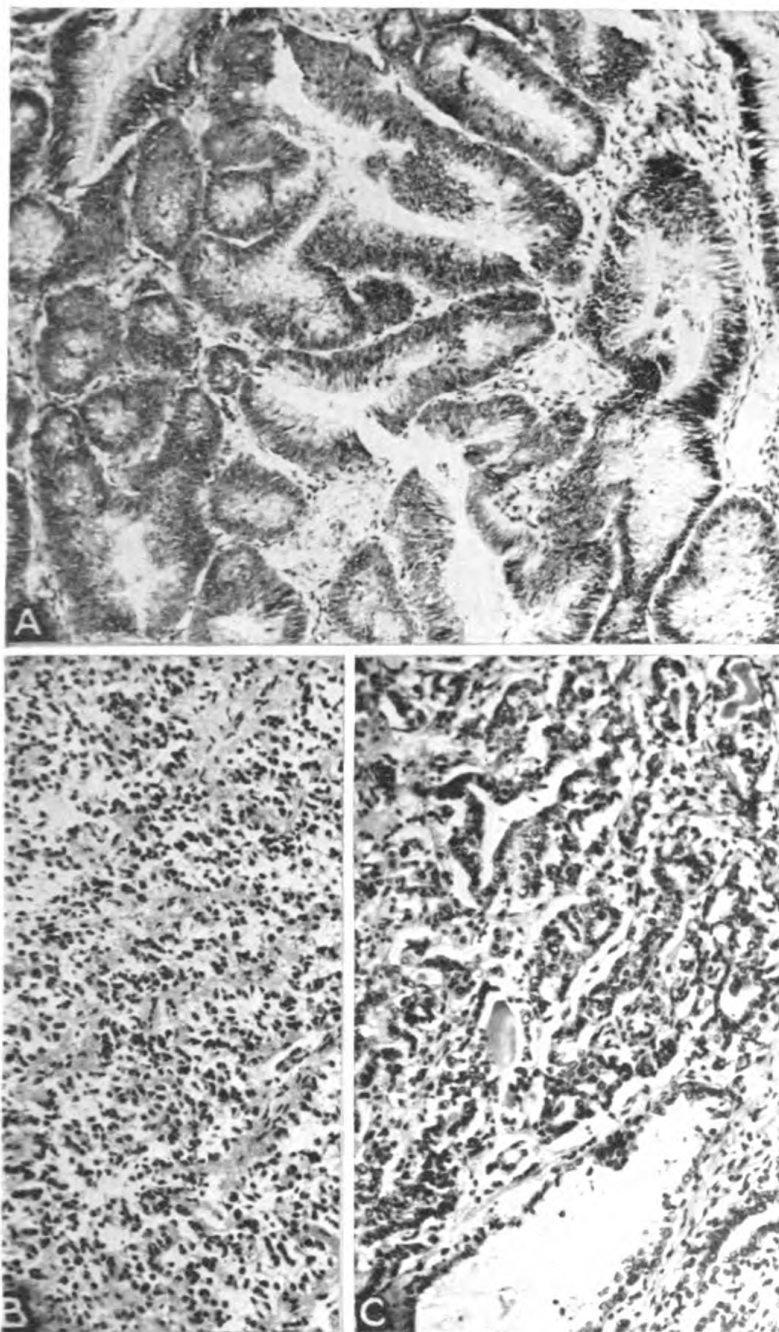


Figure 1.—A, Adenocarcinoma of a rectal polyp; B, medulloblastoma involving the roof of the fourth ventricle, the vermis and the lateral lobes of the cerebellum; C, papillary adenocarcinoma of the thyroid.

cytoplasm. The cells were arranged in sheets and aggregates which were separated in some regions by deeply staining, eosinophilic, collagenlike material. There was a slight tendency to form pseudorosettes. In some places small, round cells were arranged on a loose reticulum. Mitoses were seen. The tumor was vascular. A diagnosis of medulloblastoma was made.

NECROPSY¹

Thyroid.—(See figure 1C.) The thyroid gland weighed 25 grams. A circumscribed, firm nodular tumor measuring 2.5 cm. in diameter was found in the inferior pole of the right lobe. The cut surface of this tumor was pale yellow and demonstrated numerous small hemorrhages. Sections showed normal thyroid tissue separated by a thick, dense connective tissue capsule from a very hyperplastic, adenomatous growth of thyroid epithelium which invaded this capsule in many places. The epithelium in the adenomatous portion was composed of low to moderately high cuboidal cells arranged in simple glandular and anastomosing papillary cords. There was very little colloid. There was considerable variation in size and shape of these glandular structures and some were separated and distorted by dense, hyalinized connective tissue septa. The blood vessels were found engorged with red cells intimately associated with the epithelial cells. This was a highly anaplastic papillary tumor. The diagnosis was papillary adenocarcinoma of the thyroid.

Gastro-intestinal tract.—The esophagus, stomach, and small intestine showed no gross abnormalities. The large bowel from the cecum to the anus contained over 100 small polyps. The average size was 0.5 cm. in diameter and each was supported on a thin pedicle. Near the rectosigmoid junction an indurated, puckered scar was found on the posterior wall. Microscopic examination showed superficial erosion of the epithelium in the esophagus, stomach, and duodenum without other unusual findings. The jejunum and ileum were normal. The large bowel sections showed many pedunculated polyps with hyperplasia of the mucosal glands near the tips covering a loose connective tissue core. The papillary structure, cellular pleomorphism and invasion of the stalk as seen in the biopsy specimen was not found in any of the polyps studied. Slides made from the specimen in the large bowel removed for biopsy showed erosion of the epithelium over a scarred portion of bowel wall. Lymphocytes, a few polymorphonuclear cells, and numerous macrophages had infiltrated the scar tissue. Organized thrombi were seen in the small vessels and there was no evidence of malignant extension. The diagnosis was multiple polypsis of the large bowel.²

Brain.—There was a bony defect in the occipital region of the skull measuring 6 by 4 cm. with a wedge-shaped portion removed from the foramen magnum. The dura was absent over a slightly smaller area with thickened edges adjacent to the operative site. Small calcifications were found in the dura between the frontal lobes composing the cerebral falx. The brain bulged into these openings in the dura and skull. There was an operative defect lying between the cerebellar hemispheres. The entrance to this cavity admitted the index finger and was surrounded with red granulation-like tissue. It led into a large space lying within both cerebellar hemispheres and extended toward the roof of the

¹ Only pertinent findings are reported.

² The hereditary nature of multiple adenomata of the large bowel was described by Lockhart-Mummery and Dukes (8). They pointed out that such patients almost invariably develop cancer in one or more of the adenomata after a few years and tend to die of cancer of the large bowel at an early age.

fourth ventricle. The cerebral gyri were flattened and the sulci shallow. The base of the brain was flattened, resulting in distortion of the pons and medulla and tonsillarlike molding of the inferior tips of the cerebellar hemispheres. Multiple sections through the brain showed dilatation of all the ventricles with internal hydrocephalus. There was considerable fresh hemorrhage in the cerebellar hemispheres and into the operative cavity. Firm, friable tumor tissue surrounded the operative site. The pons and cerebral peduncles bulged over the entrance to this cavity. Areas of softening were found in the cerebellum and all of the vessels were congested. Microscopic study showed thickening of the dura with deposition of fibrin and accumulation of polymorphonuclear cells and phagocytes on the inner surface. The sections showed an ill-defined border between the normal tissue and the tumor. The tumor tissue resembled the surgical specimen. The surrounding brain tissue showed degeneration, necrosis, small calcifications, and infiltration of glial cells. Sections from other regions of the brain showed perivascular cuffing composed of polymorphonuclear cells.

Heart.—The heart weighed 325 grams. The right auricle and ventricle appeared dilated. The heart valves, the left auricle and ventricle were normal. The coronary ostia were patent. A fresh thrombus extended for $\frac{1}{2}$ inch and filled the lumen of the circumflex branch of the left coronary artery. Numerous small reddish dots were found near the base of the heart on the cut surfaces of the interventricular septum. Histologic study showed early degenerative changes with loss of some of the nuclei in the cardiac musculature. A few extravascular, polymorphonuclear cells, erythrocytes and macrophages were seen. The small vessels were engorged with blood. A section through the coronary artery showed a fresh fibrin and red cell thrombus attached to the intimal wall by a small margin and filling about 85 percent of the lumen. The surrounding alveolar tissue contained numerous polymorphonuclear cells, macrophages and a small amount of hemorrhage.

A careful gross and microscopic study of all the organs and lymphatics failed to reveal any evidence of metastasis.

Pathologic diagnosis.—The pathologic diagnoses were: medulloblastoma involving the roof of the fourth ventricle, the vermis and the lateral lobes of the cerebellum; papillary adenocarcinoma of the thyroid; adenocarcinoma of a rectal polyp; multiple polyposis of the large bowel; terminal bronchopneumonia; and coronary occlusion.

COMMENT

A case is presented in which the symptoms and signs were those of a cerebral neoplasm. The possible metastatic nature of this tumor was suggested by the finding of an adenocarcinoma of a rectal polyp. The findings were further confused by the presence of a firm tumor apparently in the thyroid gland. Because of its duration for 10 years, it was concluded that this tumor was undoubtedly an adenoma of the thyroid and not a metastatic lesion from the bowel. However, the possibility of a primary malignancy in the thyroid itself with metastasis to the brain could not be eliminated. Exploration revealed a medulloblastoma involving the roof of the fourth ventricle, the vermis and the lateral lobes of the cerebellum and at autopsy a papillary adenocarcinoma of the thyroid was found.

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OPERATIVE POSITIONS IN NEUROSURGERY

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IN NO field of surgery is the exact positioning of a patient on the table more important than in the field of neurosurgery. The bony relationship of the part of the nervous system involved necessitates careful positioning in order to obtain a maximum exposure without undue destruction of the skeletal framework. Far too often is this important procedure left up to an intern, nurse, or anesthetist not having a clear conception of what is expected to be accomplished by a specific position.

In order to assist operating room personnel in carrying out this assignment efficiently, this article with its supplementary photographs is presented. Each position is discussed as to its purpose, advantages, and disadvantages.

POSITIONS

1. *The lateral approach for lumbar intervertebral disk explorations or for hemilaminectomies.*—The patient is placed on the table with the involved side up. The kidney bar is located about 2 inches above the iliac crest and is elevated 2 inches. The under thigh and leg is flexed to at least 90°; the upper, extended. A small pillow or folded sheet is placed beneath the under thigh and a larger one between the thighs. This is done in order to keep the back perpendicular to the table. Two adhesive bands are placed over the buttocks and across the lower knee to maintain this position. It is important to pad the lateral aspect of the upper leg to protect the peroneal nerve where it courses over the head of the fibula. A chest support may be added anteriorly and posteriorly for further stabilization. The table is then broken in the middle, as shown in figures 1 and 2, to spread the lamina apart and to eliminate unnecessary removal of bone. It is usually advantageous to tilt the entire table toward the operator. Trays are placed over the patient and the scrub nurse stands on the opposite side. The operator and his assistant are seated with a spotlight behind them.

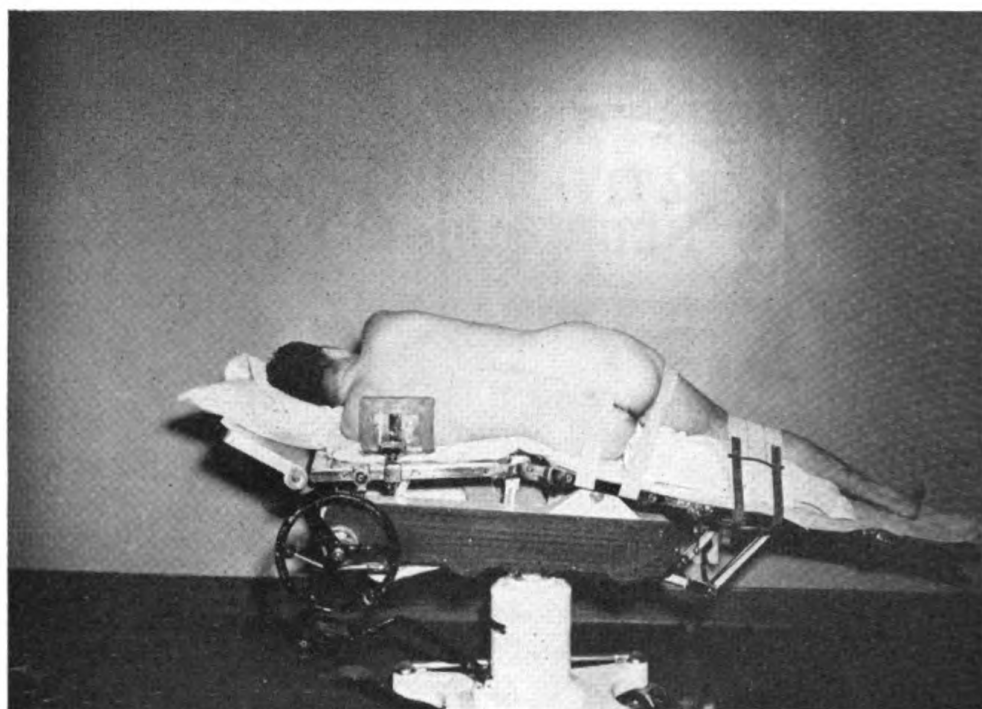


Figure 1.

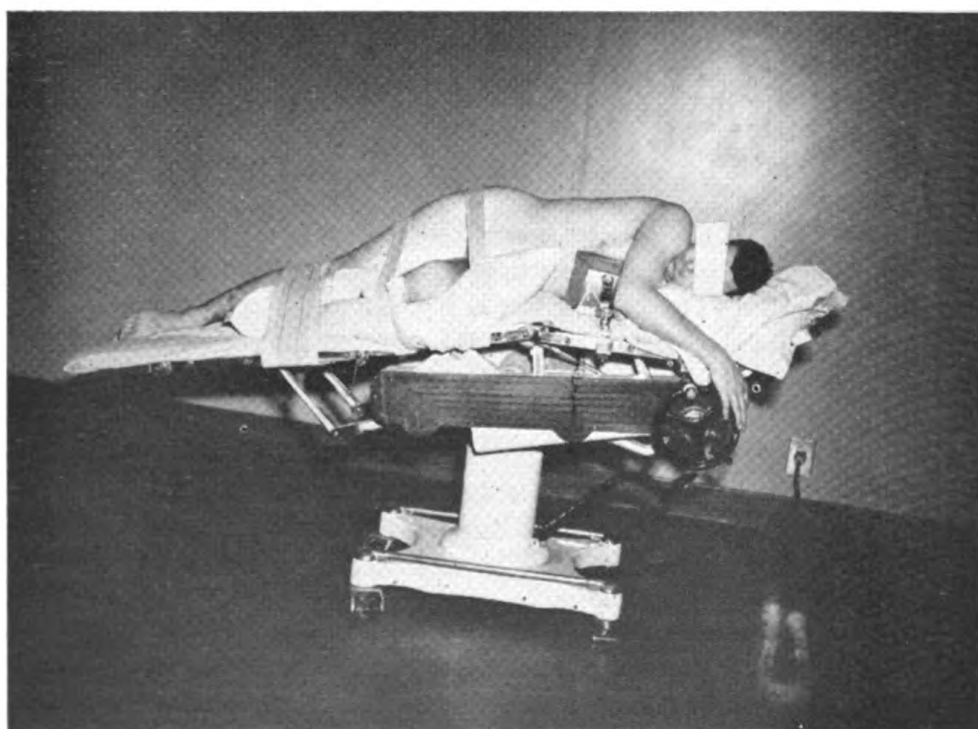


Figure 2.

Figures 1 and 2.—The lateral position for intervertebral disk operations and hemilaminectomies.

In this position the maximum spreading to the interlaminar spaces is obtained without a serious drop in blood pressure. Bleeding is minimized and easily controlled. Interlaminar exposures and hemilaminectomies are easily done. If a laminectomy is indicated, the prone position is probably better, but a laminectomy can be performed from this approach without difficulty.

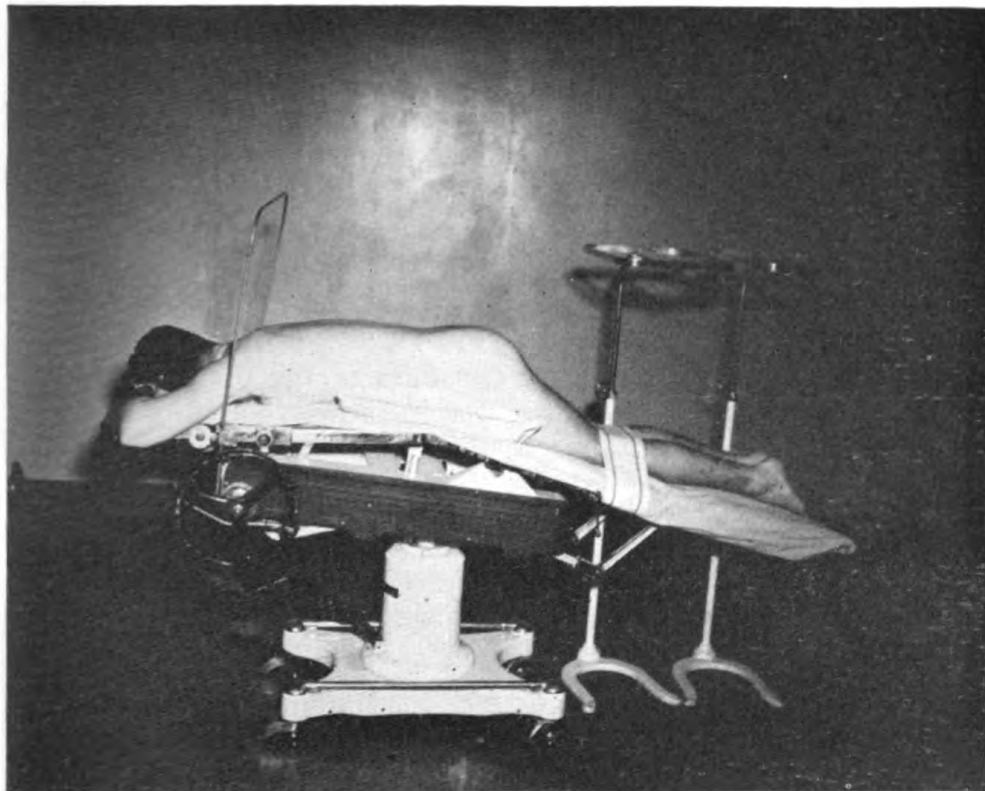


Figure 3.—The prone position for laminectomies and intervertebral disk operations.

2. *The prone position (fig. 3) for laminectomies in the thoracic or lumbar regions.*—This may be used for interlaminar approaches also. It is important to place two pillows rolled together beneath the patient. They form a trough and at the same time support the patient. This central trough is important to prevent abdominal compression which in turn causes engorgement of the extra dural veins. The degree of flexion is easily controlled by breaking the table or lowering the legs. While bleeding in this position is not as great as that in the next presented vertical approach, it is still troublesome. Some patients react with unfavorable blood pressure changes upon lowering the legs. Intravenous neosynephrin will counteract this drop.

3. *The vertical position for intervertebral disk operations.*—In order to better visualize the disk herniation under the effects of weight



Figure 4.—The vertical position for intervertebral disk operations.

bearing, some prefer the vertical approach. The table is folded into a chair. The patient is seated in a reverse manner straddling this with a pillow between the abdomen and the chair back (fig. 4). The legs are supported by placing the feet on stools, the height of which may be varied. The table head is flexed until it is parallel with the floor so that the arms may be crossed comfortably on this. One tray is placed on each side and an ether screen is placed over the top. The extent of forward flexion is easily regulated by changes in the table throughout the operation. Bleeding is usually greater in this position and the

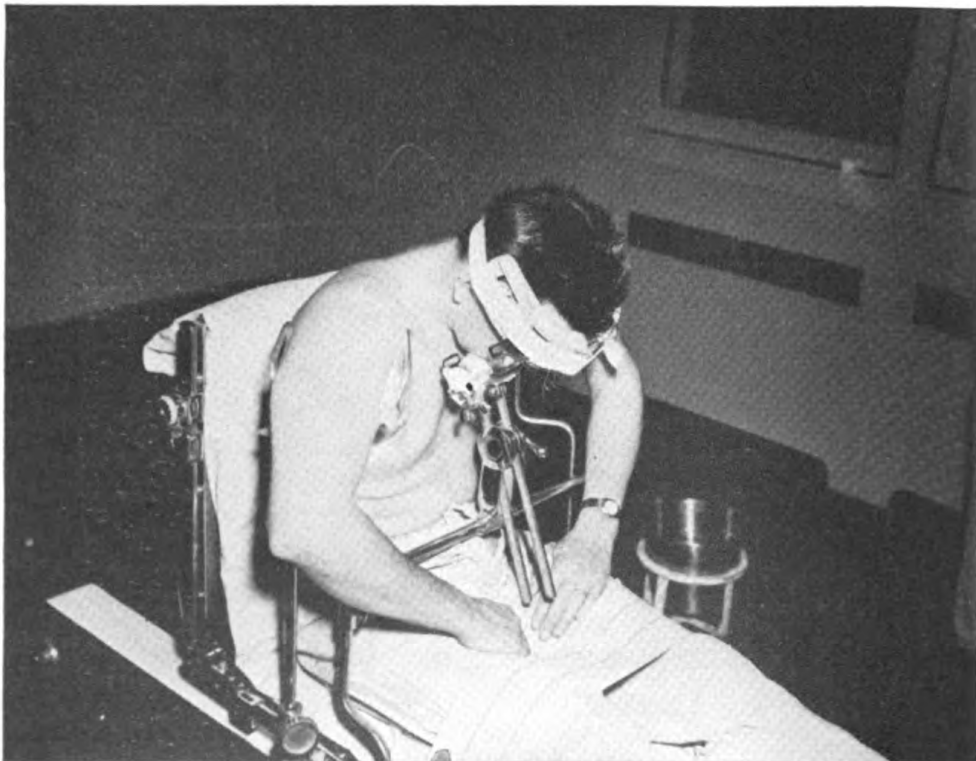


Figure 5.—The position for cervical laminectomies or for cervical intervertebral disk operations.

dural tube is under greater pressure.

4. *The position for cervical laminectomy or disk operation.*—A partial sitting position using the Craig headrest is utilized for this type of surgery. The table is partially flexed and at the same time tilted backward. The back is elevated and the head flexed forward into the headrest, which is attached to the middle of the table (figs. 5 and 6). Two axillary arm supports are placed in Mayo stand holders beneath the operating table (fig. 7). It is important to pad these well to prevent brachial plexus injury. A canvas strap is placed over the thighs to prevent the patient sliding.

While this is a fine position for cervical disks or tumors it cannot be used for those cases necessitating head traction throughout the operation. A modified prone position with the head supported on a different style headrest must be used.

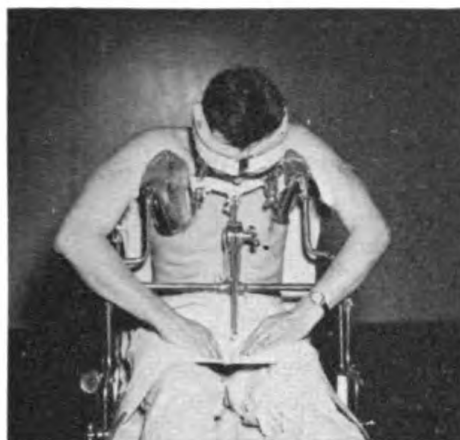


Figure 6.—The position for cervical laminectomies or for cervical intervertebral disk operations.

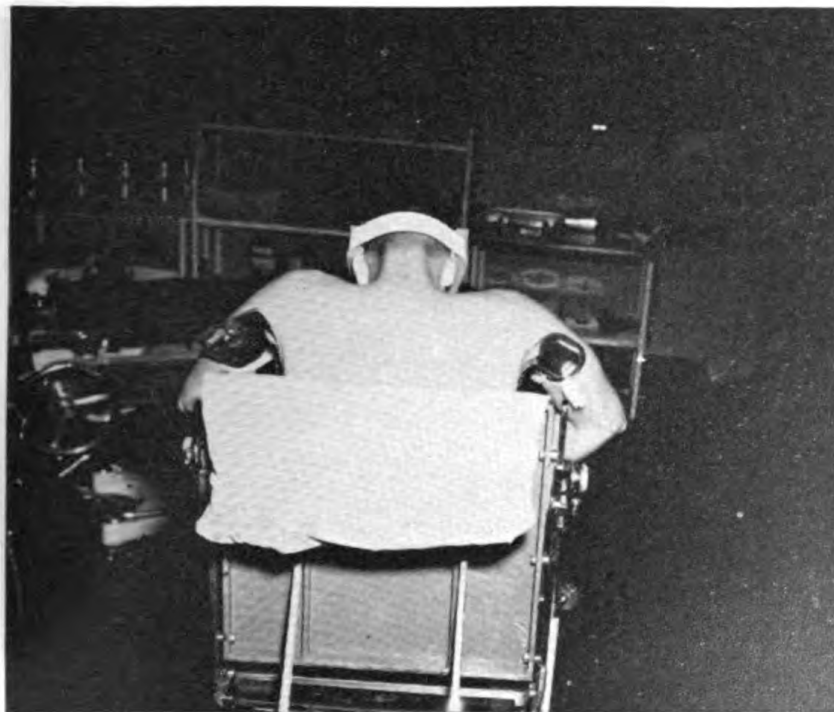


Figure 7.—The position for cervical laminectomies or for cervical intervertebral disk operations.



Figure 8.—The position for ventriculography and frontoparietal craniotomy.

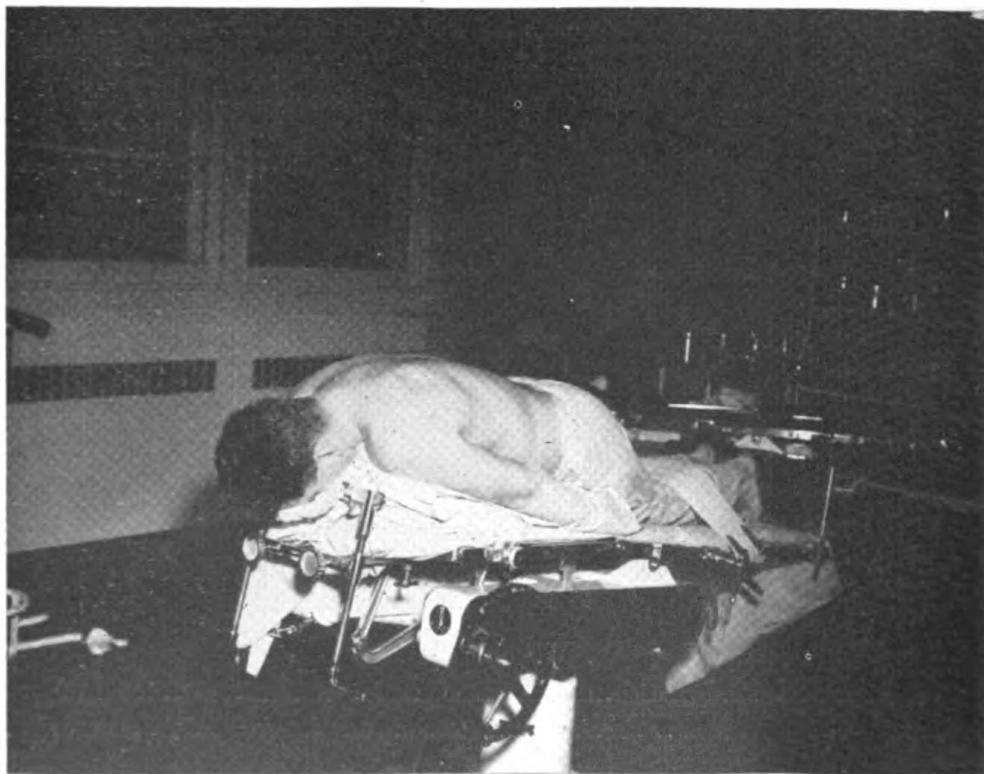


Figure 9.—The position for posterior fossa craniotomy.

5. *A position for ventriculograms or frontoparietal craniotomies.*—The King headrest may be used profitably for this type of surgery. In the usual frontal or parietal craniotomies it is only necessary to have the patient in a supine position with his head resting straight or obliquely on the rest. For a ventricular puncture from a posterior trephine it is helpful to place a small sandbag across the headrest, thereby modifying it into a combination occiput and cervical rest. The entire piece must be angled inward and raised in order that free access to the flat occipital region may be obtained. The entire table is tilted up and thigh straps are placed to hold the patient in position (fig. 8). It is important that the headrest is well under theinion as it is most troublesome to have the edge of the rest protruding into the operation field.

6. *A position for posterior fossa explorations.*—The important feature of this position is to have the chest built up sufficiently to allow the head to flex forward into the face rest (fig. 9). One or two medium-sized pillows are usually sufficient to give the proper angle. The rest must be well padded as the face often becomes markedly edematous about the nose and mouth after a session in this prone position. It is necessary to tilt the entire table forward but only to such a degree that the occiput is parallel to the floor.

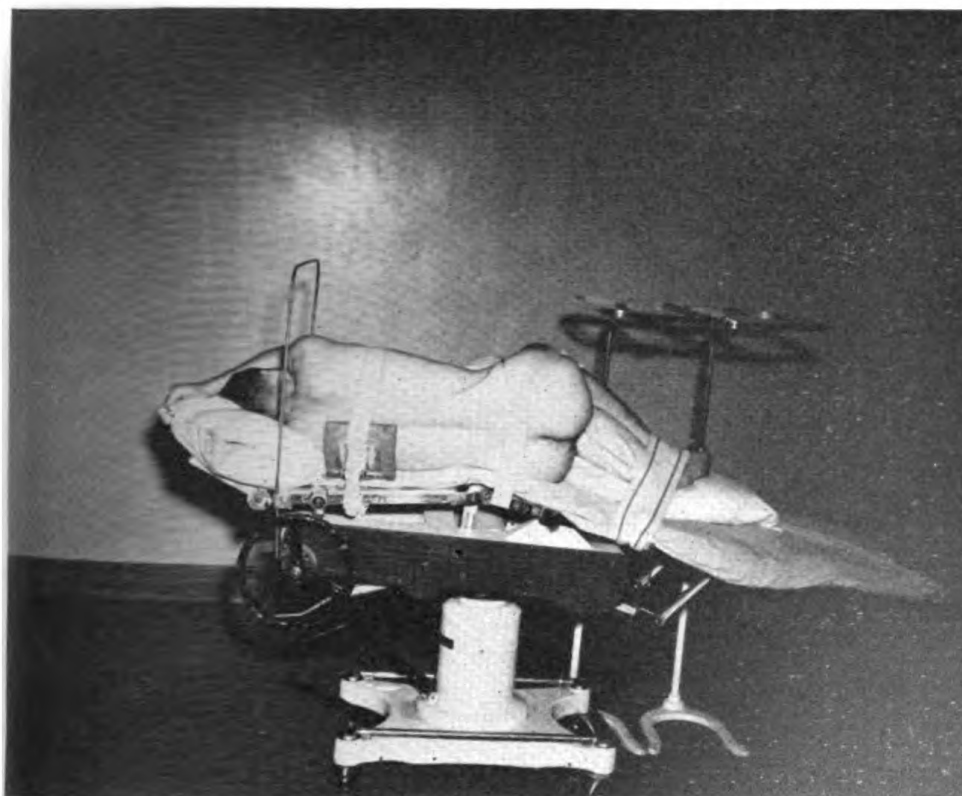


Figure 10.—The position for sympathectomy.

7. *The position for sympathectomies by the posterior approach.*—The differences between this and the lateral approach to the intervertebral disk operations are small but most important. The purpose of elevating the kidney rest and flexing the table is, in this case, to spread apart the 12th rib from the iliac crest and thus make room for the operator's hand in spreading apart the muscle layers. In contradistinction to the position used for the lateral approach to the intervertebral disk, in this procedure it is essential to have both thighs and legs flexed to 90° in order to relax the psoas muscles and make exposure of the sympathetic chain possible (fig. 10).

This position may be used for either lumbar or thoracolumbar sympathectomies.

SUMMARY

The correct position of the patient on the operating table for intervertebral disk operations; laminectomies in the cervical, thoracic, and lumbar areas; craniotomies; and for sympathectomies as performed at this hospital, is presented. The rationale for each particular position is given and its advantages and disadvantages discussed briefly.

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PREVENTIVE MEDICINE



STREPTOMYCIN THERAPY IN PROGRESSIVE PULMONARY TUBERCULOSIS

Report of 37 Cases With 1 Year Follow-Up¹

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A joint endeavor of the Army, Navy, and Veterans' Administration to determine the effect of streptomycin upon human tuberculosis was undertaken in the spring of 1946. A common protocol for the type of case, clinical and laboratory studies, dosage and length of treatment was adopted. The type of case selected for treatment was one which had proved pulmonary tuberculosis of moderate or far-advanced extent, was not immediately suitable for collapse therapy, and had an exudative pulmonary lesion which had shown progression or at best stability during a 60-day observation period. The immediate results of therapy using streptomycin in dosage of 1.8 or 2.0 grams per day were reported by the seven original study units in the December 1947 issue of *The American Review of Tuberculosis*.

It was evident from the results analyzed that streptomycin had a definite but probably limited place in the therapeutic armamentarium against tuberculosis. Little effect was observed in the fibrocaseous type of lesion, but clearing of some degree occurred in 85 percent of the unstable exudative lesions. Clearing of the exudative component of the disease often made possible needed collapse measures. Clinical improvement was even more impressive than the roentgenographic changes. Reduction in sputum volume, temperature level, and gain in weight were almost universally observed. Clinical observation and laboratory studies pointed out, as had been done previously (1) (2), two great disadvantages to streptomycin therapy, namely, damage to the vestibular apparatus of the patient and developed in vitro

¹ Presented before the Sixth Streptomycin Conference of the Veterans' Administration, St. Paul, Minn., 21 October 1948.

resistance of the tubercle bacillus to streptomycin. Further studies were needed to determine the seriousness of these unwelcome effects of the antibiotic. Also, data were needed to determine the optimum dosage and length of treatment. Accordingly, protocols were changed to include different dosages and durations of treatment.

The coordinated study was continued and enlarged so that by April 1948, when the Fifth Streptomycin Conference was held in Chicago, the number of hospitals participating in the study had increased from 7 to 48, and the number of patients treated had reached 3,032; of these, 943 were treated primarily for pulmonary tuberculosis. An analysis of the results of treatment was prepared by the Central Office of the Veterans' Administration and published as a report to the Council on Pharmacy and Chemistry in the *Journal of the American Medical Association*, volume 138, No. 8, October 23, 1948. In the cases treated primarily for pulmonary tuberculosis, it was concluded that reduction in dosage of streptomycin from 2.0 grams to 1.0 gram per day resulted in no loss of therapeutic efficiency and further reduction to 0.5 gram per day apparently resulted in no loss of therapeutic efficiency; nor was there any such loss encountered when the daily dose was divided into two instead of five daily injections. Reduction in dosage from 2.0 grams to 1.0 gram to 0.5 gram per day was accompanied by a marked and gratifying decrease in the incidence of toxic manifestations. Vertigo, the most frequent and probably the most significant toxic reaction to streptomycin, decreased in incidence from 80 to 28 percent and to 6 percent for the respective dosage regimens. When the interval of treatment was shortened from 120 to 60 days and the dosage maintained at 2.0 grams per day, again there was no loss of therapeutic efficiency and the incidence of vertigo dropped from 80 to 63 percent.

Much needs to be learned about the problem of bacterial resistance. In the majority of cases, organisms isolated after 60 days of treatment were resistant *in vitro* to streptomycin. The degree and time of developed resistance apparently was not influenced by reduction in dosage. Since the therapeutic result in the patients treated 60 days was about as good as in those treated 120 days, it was suggested that the length of treatment be further shortened to 45 days, with the hope of preventing organism resistance and thus making possible future treatment with streptomycin should relapse occur. This problem is under study at the present time.

The initial enthusiasm over the good therapeutic result obtained in this prognostically poor group of patients was dampened somewhat by the incidence of relapse following treatment. Relapse during treatment, or more often after treatment, had occurred in approximately one-third of the patients in from 1 to 12 months after dis-

continuing streptomycin. The incidence of relapse following treatment with smaller doses and shorter courses apparently was no greater than with the 2.0-gram, 120-day regimen, although the number of the former cases is too small and observation period too short for definite statement. It was generally agreed that streptomycin alone rarely provides definitive treatment and that its greatest usefulness in pulmonary tuberculosis lies in conjunction with bed rest and collapse therapy. Probably the optimum time to induce collapse is during the first weeks of streptomycin therapy, before the tubercle bacillus becomes resistant to streptomycin. This, too, is being studied further.

The U. S. Naval Hospital, Sampson, N. Y., was one of the original seven units included in the cooperative study. At that hospital, 37 patients with progressive pulmonary tuberculosis were treated with streptomycin, in dosage of 1.8 grams per day for a period of 120 days (given intramuscularly in doses of 0.3 gram at 4-hour intervals). The immediate results of therapy have been reported previously (3). The present report deals with the status of the patients 1 year after completion of the initial course of streptomycin, as determined by replies to questionnaires sent both to the patients and their present physicians. Partial or complete reports have been returned on all living patients, 30 in number. Seven died within the year after completion of streptomycin therapy. Twenty-four patients remained under treatment in hospitals and six had been discharged to home.

CLINICAL REPORTS

Symptomatic improvement was observed within the first few weeks after beginning therapy. Improvement of cough, appetite and chest pain were particularly noteworthy, and were parallel to the more measurable signs of improvement such as decrease in temperature level, sputum volume, sedimentation rate, and gain in weight. The maximum clinical improvement occurred during the first 30 days of therapy. As shown by figure 1, approximately three-fourths of the patients were losing weight prior to therapy, whereas during therapy this course was reversed and three-fourths gained weight. Half the patients continued to gain during the year after treatment. The average gain during the 4 months of therapy was 16 pounds, and in the 12 months after therapy was 20 pounds.

Figure 2 shows the average peak temperature, sputum volume, and sedimentation rate changes of the 30 patients alive 1 year after therapy. Significant decreases in each were observed during and after treatment. What appears to be an increase of 0.1° F. in temperature 1 year after treatment may be due to the fact that on several follow-up reports, the temperature was recorded as "normal" rather than an actual temperature reading. The 7 patients who did not survive the year of observa-

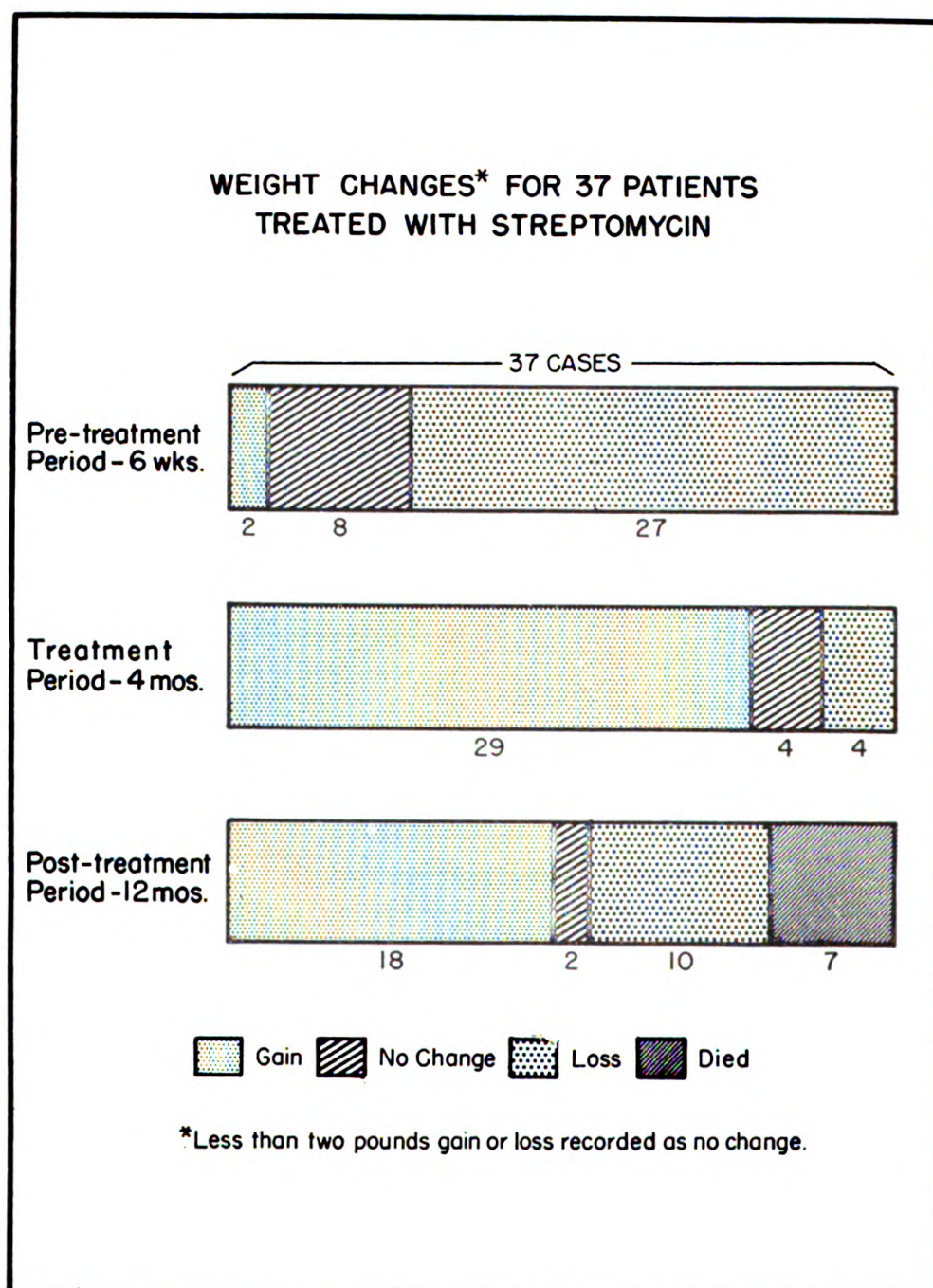


Figure 1.

tion had shown an equally good response during therapy, on the basis of temperature and sputum volume, but practically no change in sedimentation rate. Four lost weight during treatment.

Conversion of sputum during treatment was seen less frequently than has been reported by some investigators (4) (5). Only 3 of the 37 patients in this series converted from positive to negative. This

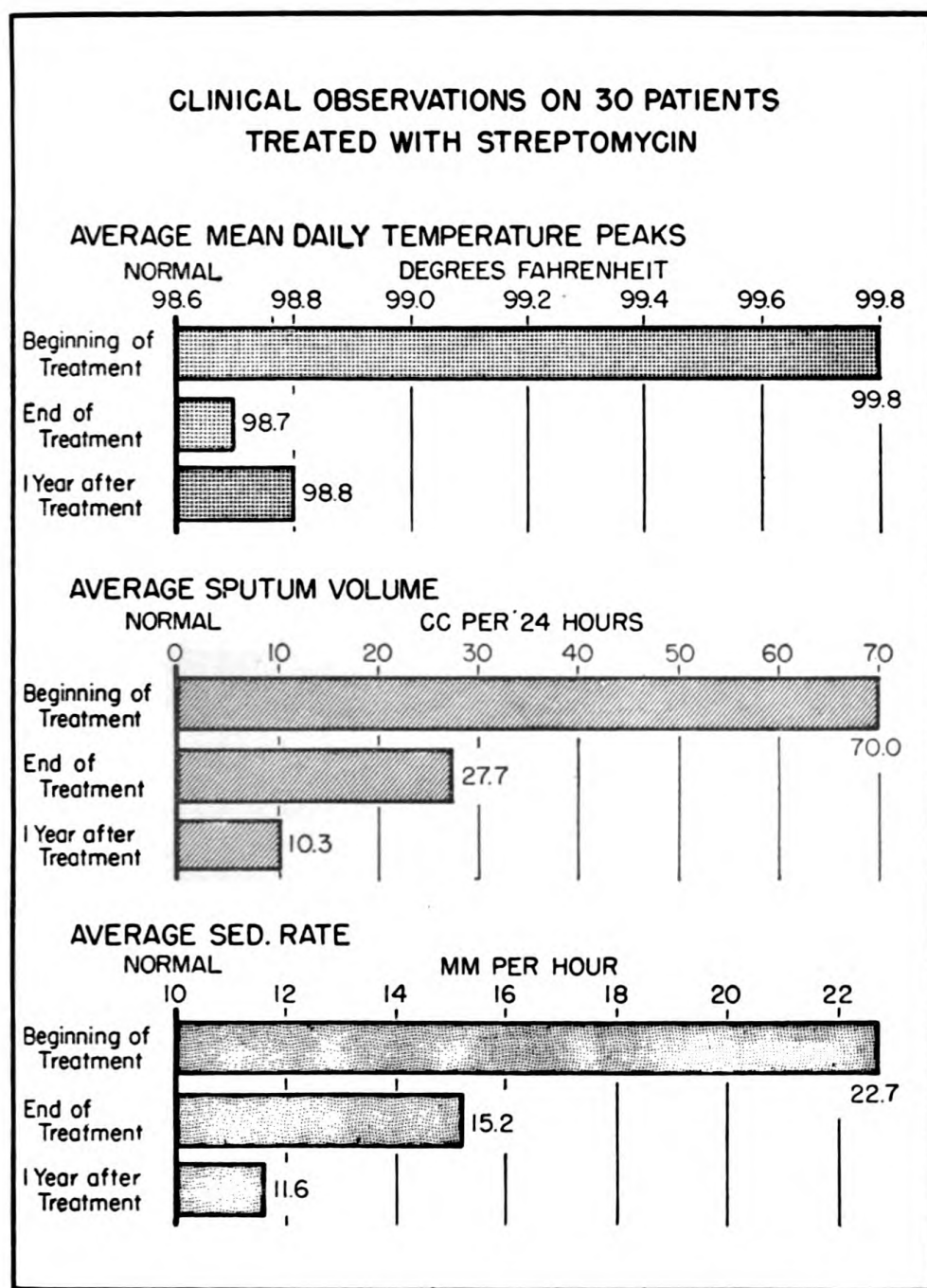


Figure 2.

may have been due to the advanced stage of the disease (30 of the 37 patients had open cavities throughout therapy) or to the rigid criteria for a negative sputum. A sputum was not recorded as negative unless at least three 72-hour concentrated sputum specimens (concentrated gastric specimens if sputum were scanty or recently negative) collected at 2-week intervals, failed to reveal *Mycobacterium tuberculosis*

by smear and culture. Unfortunately, the results of comparable studies were not available at the end of 1 year. In 19 cases, the studies were considered adequate; 9 were negative and 10 were positive by smear and culture of sputum or gastric contents.

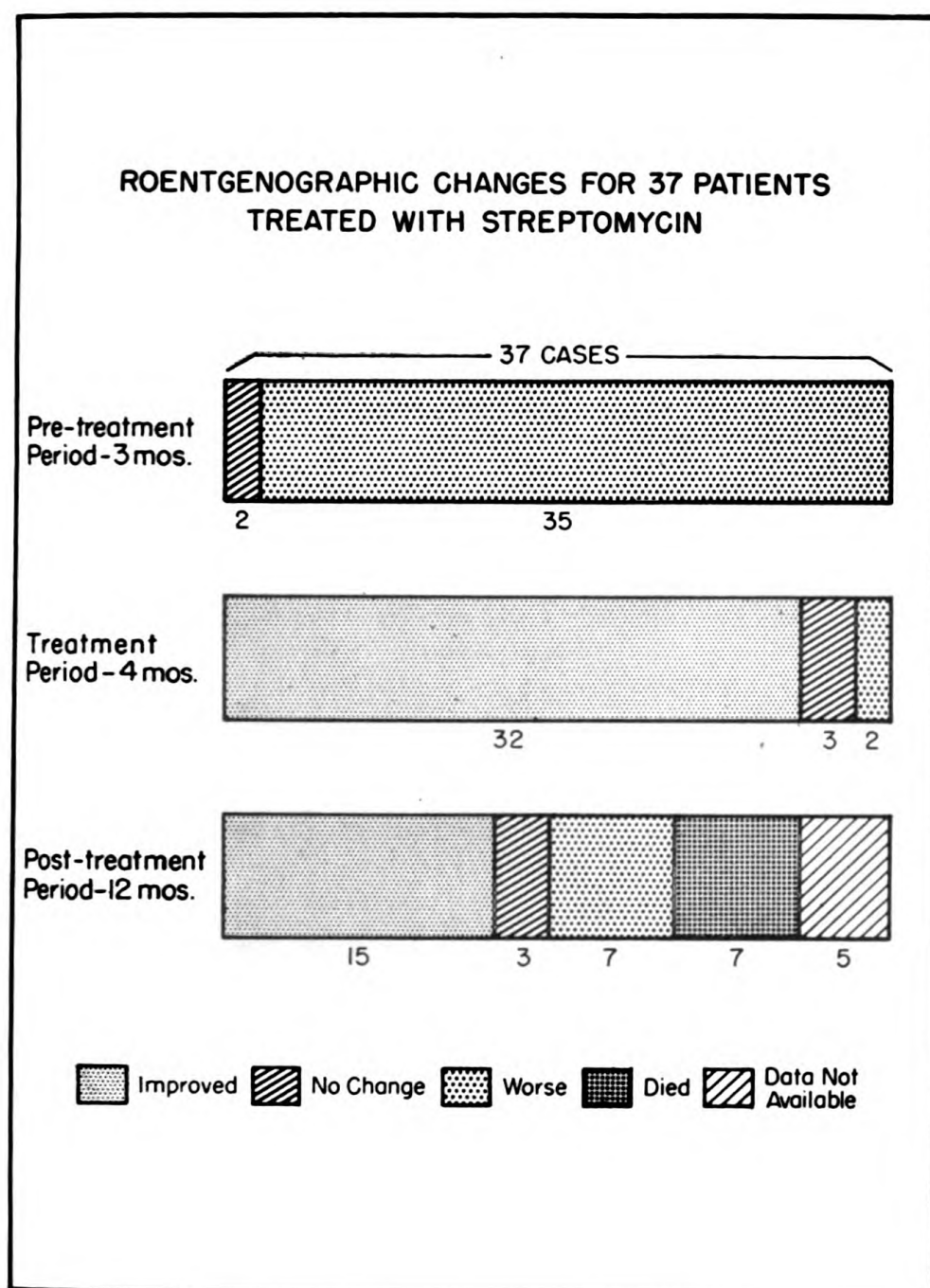
ROENTGENOGRAPHIC CHANGES

Chest roentgenograms taken approximately 1 year after completion of treatment were obtained on 25 of the 30 patients and were compared with films made before, during, and immediately after therapy. The patient was scored as improved if there was evidence in the roentgenogram of decrease in the amount of infiltration and/or size of pulmonary cavities. The patient was scored as worse if the converse were true. The results of comparison are shown in figure 3. During the 90-day pretreatment period, there was roentgenogram evidence of progression of disease in 35 of the 37 patients, 2 remaining stationary. The evidence of progression consisted mainly of bronchiogenic spreads or increase in size of existing infiltrates. Increase in exudative infiltration during the pretreatment period was a major criterion for selection of patients for treatment. During the 120-day period of treatment, without alteration of bed rest and without additional collapse measures, there was a reversal of this trend so that 32 patients showed significant and continued improvement in the roentgenogram. Two additional patients showed small bronchiogenic spreads during the third and fourth months of therapy but in both, marked clearing of exudative disease had appeared during the first 2 months of therapy. The films of the remaining three patients showed no significant change during the treatment period.

One year following the course of streptomycin, there was evidence of further improvement in the chest films of 15 patients. Three showed no significant change. Seven patients showed more disease than at completion of treatment. However, films made 1 year after completion of treatment compared with those made prior to treatment showed less disease in all except one patient. Data regarding roentgenogram follow-up were not available on 5 patients, all of whom were known to be living 1 year after completion of treatment. Since these 5 patients had been discharged from hospital treatment and each reported clinical improvement in response to questionnaires, it is quite probable that the roentgenograms also would show this improvement.

RELAPSE

Relapse after treatment, as judged by extension of disease in the roentgenogram, occurred in 7 patients (included are 2 with further extension of relapse which began during treatment). Although

*Figure 3.*

specific data are available in only 3, it must be assumed that relapse occurred in all 7 patients who died following streptomycin therapy. Of the 10 known relapses, evidence of this appeared during the first month after streptomycin was discontinued in 6 patients, during the second month in 2, and during the third and tenth months in 1 each. It was noted that prior to treatment these patients had more extensive

caseous and ulcerative disease than did those who maintained their improvement.

Nine patients in whom relapse occurred were retreated with streptomycin in dosage of 2 grams per day for periods of 60 to 120 days. Although initial symptomatic and, at times, roentgenographic improvement was noted, this certainly was not marked or lasting. One year after the initial course of streptomycin, the status of this retreated group of nine patients was as follows: three dead, four worse, and two unchanged.

COLLAPSE MEASURES

If open cavitation in a patient responding poorly to bed rest can be considered an indication for collapse measures, then 34 of the 37 patients needed some type of collapse when selected for the study. However, it was considered that collapse was not the best therapy at that time, either because of poor physical condition of the patient or the acute nature of the disease process. In order that the effect of streptomycin be evaluated, it was necessary that collapse measures be withheld during the 120-day period of streptomycin therapy. In several instances improvement during the first and second months of therapy was of such a degree that, in retrospect, collapse measures might have been used safely as insurance against relapse.

Thoracoplasty has been performed since therapy in 7 cases and other collapse measures in another 7. Without the beneficial effect of streptomycin it is quite unlikely that these patients would have had the opportunity for surgery. One year after streptomycin was discontinued 15 patients had improved to a point where, in the opinion of their physicians, no collapse measures were indicated. One patient remained too ill to permit needed surgical intervention.

RESIDUAL VESTIBULAR MANIFESTATIONS

Vertigo was the most frequent symptom encountered which was thought to result from the toxic action of streptomycin. This occurred in 28 of the 30 patients who have been followed for 1 year. At the end of 1 year, 5 patients still complained of vertigo. In none was this severe. Ataxia occurred during treatment in 26 of the 30 patients. One year later, 15 patients still noted difficulty in maintaining balance while walking. Several patients volunteered that they had symptoms referable to accommodation such as "difficulty in focusing eyes on distant or moving objects," "eyes tire easily," "jumpy feeling in eyes." Caloric tests of vestibular function conducted at completion of treatment showed absent response to cold water stimulation in all cases. The results of this test are available in only 4 cases at the end of 1 year. In each, the response to caloric stimula-

tion remained absent or markedly diminished. It appears that some degree of permanent damage to the vestibular apparatus has been done in about half the cases observed for 1 year after streptomycin therapy. Since none of these patients had returned to their prewar occupation, a further period of observation will be needed to determine the degree of disability resulting from this vestibular disturbance.

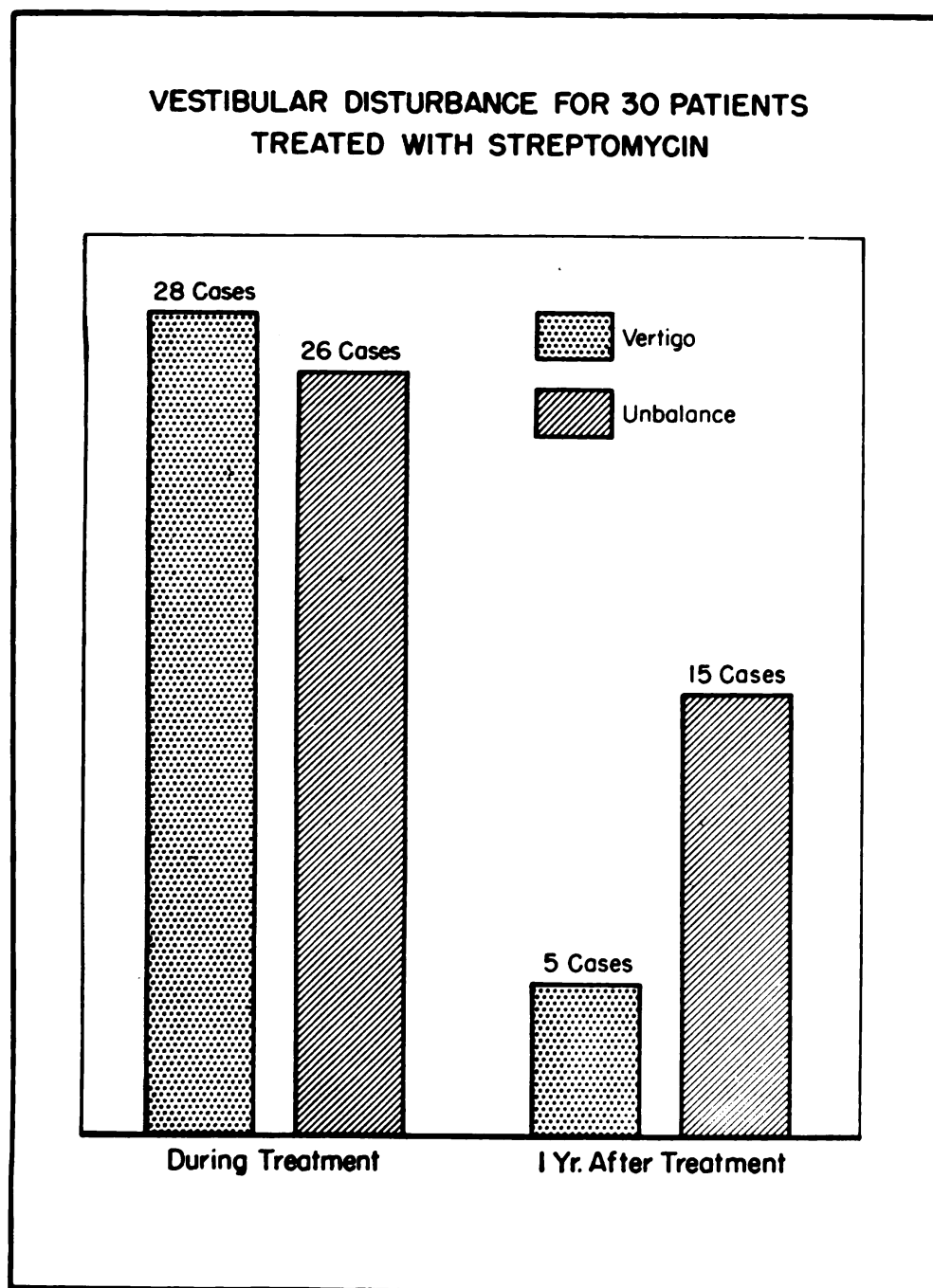


Figure 4.

SUMMARY AND CONCLUSIONS

1. The results of treatment and 1 year follow-up are presented for 37 cases of progressive pulmonary tuberculosis treated with streptomycin in daily dosage of 1.8 grams for a period of 120 days.

2. A reversal of the progressive trend of the disease was observed during treatment in 34 of the 37 patients. The improved status, both clinical and roentgenographic, was further improved or at least maintained at 1 year in half of the number treated. Relapse after treatment occurred in more than one-third of the patients. A second course of streptomycin was without benefit in the relapse cases.

3. The incidence of relapse clearly indicates that streptomycin alone is not definitive treatment in the type of pulmonary tuberculosis included in this series. One should not be misled by the degree of improvement in judging prognosis or the need for continued bed rest. Caseous and ulcerative lesions are prone to relapse and the patients with such lesions should be selected for treatment with streptomycin only as a part of a therapeutic plan which includes surgical collapse to be performed as soon as the condition of the patient permits.

4. Thoracoplasty was performed in 7 patients and other collapse measures used in another 7 patients, during the year after streptomycin therapy. It was considered that these procedures were made possible by streptomycin.

5. Subjective evidence of damage to the vestibular apparatus was present 1 year after treatment in half the patients. More recent studies indicate that the incidence of vertigo (and probably damage to the vestibular apparatus) can be materially reduced without loss of therapeutic efficiency, by decreasing the daily dose of streptomycin to 1 gram or less. Also shorter regimens of treatment appear to offer as good a therapeutic result with less vestibular damage. In this series the maximum symptomatic improvement, gain in weight, reduction in sputum volume and temperature occurred during the first 30 days of treatment.

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DISINFECTION OF BARBERS' INSTRUMENTS

A Method Employing Two Quaternary Ammonium Compounds

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The problem of the routine disinfection of barbers' instruments has been of concern to naval medical officers, particularly when the danger of fungal infections have appeared to be more acute than that which normally exists. Various methods have been employed but none has been completely satisfactory from the standpoint of practicability and freedom from objectionable features.

Various reports on the efficacy of quaternary ammonium compounds as disinfectants (1) (2) and the acceptance of some of these by the Navy Department for certain purposes suggested investigations of the suitability of two of these agents for disinfecting barbers' instruments. Adequate evidence of lack of tissue toxicity of these compounds has been published (3).

MATERIAL

The two quaternary ammonium compounds were hyamine concentrate (di-isobutyl-phenoxy-ethoxy-ethyl-dimethyl-benzyl-ammonium chloride), and phemerol concentrate (para-tertiary-octyl-phenoxy-ethoxy-ethyl-dimethyl-benzyl-ammonium chloride). Sodium phosphate (tertiary) was employed as a detergent.

Known cultures used during the experiments were: *Escherichia coli*, *Staphylococcus aureus*, and *Trichophyton mentagrophytes* (ringworm). The bacteriological procedures employed in testing the bactericidal and fungicidal properties of the two agents followed those

generally employed for experimental purposes along such lines. Disinfectant procedures in all instances were carried out at room temperature.

PROCEDURES AND RESULTS

In order to establish the bacterial and fungal flora that might be normally encountered, one set of barbers' instruments was obtained and given to the station barber and after 4 hours of routine use was returned to the laboratory where the instruments were cultured to media suitable for the cultivation and growth of organisms that might be encountered. This procedure was carried out on each of 30 successive days. During this period of observation, a total of 154 initial cultures were made from the used instruments, resulting in a total of 443 strains of organisms. Classification was carried ultimately only to genera or group. (See table 1.)

TABLE 1.—*Bacterial and fungal flora encountered in 154 initial cultures of barbers' instruments after routine use resulting in the isolation of 443 strains of organisms*

Fungi		Bacteria	
Genus	Number	Group	Number
Pichia.....	35	Gram-positive cocci.....	340
Penicillium.....	6	Gram-negative cocci.....	18
Alternaria.....	4	Gram-positive bacilli.....	17
Aspergillus.....	4	Gram-negative bacilli.....	15
Mycelia.....	2	.....	.....
Torula (colored).....	2	.....	.....
Total.....	53	.....	390

After establishing the bacterial and fungal flora, several trials with phemerol in different dilutions and exposure times were made to determine an effective strength and exposure time for the agent. After 4 hours of routine use in the shop the instruments were cultured and then immersed in the disinfecting solutions for the allotted exposure time, then removed and recultured. The results of tests using phemerol in dilutions 1:160 and 1:4000 showed essentially no change in flora due to the agent used. When trisodium phosphate was added in a concentration of 0.8 percent, and with an exposure time of 10 minutes, there was with both phemerol and hyamine in dilutions of 1:500 a complete reduction in bacterial and fungal flora in all instances.

In order to determine any injurious effect of the agents to the barbers' instruments, a set was immersed in a solution phemerol (1:500 with trisodium phosphate) for 43 days, and in a similar hyamine preparation for 37 days. No corrosive action or other deleterious effect was observed to the instruments after this period of exposure.

The results obtained from the above experiments indicated that 1:500 dilutions of both agents with trisodium phosphate were effective disinfectants. It was considered advisable, however, to determine the efficacy of the two agents in a series of dilutions, both with and without the detergent. For these tests, known cultures of *E. coli*, *S. aureus*, and *Tr. mentagrophytes* were used. It was found that, under the conditions employed, the addition of trisodium phosphate increased the killing effect of the two disinfectants approximately tenfold. It was observed, also, that the two agents were apparently effective in dilutions appreciably higher than 1:500; for reasons to be discussed later, however, the differences were believed to provide a reasonable margin of safety.

Experiments were conducted to determine the length of time, under possible routine conditions during which a 1:500 dilution of phemerol or hyamine would remain active with trisodium phosphate added. The same test organisms were employed and the tests conducted after the solutions had been prepared and allowed to stand for periods of 2, 4, 8, 12, and 24 hours. Under these conditions, no deterioration in bactericidal or fungicidal effect was observed during the 24-hour period with the detergent added.

Using the same test organisms, a test was performed in which the hand clippers were used as the agent for transferring the organisms. It was demonstrated that hand clippers served to carry the test organisms but that, under the conditions employed, the disinfecting procedures were completely effective since only the control cultures were positive.

As a final test, freshly prepared dilutions of phemerol and hyamine with trisodium phosphate were supplied to the station barber with instructions as follows: After each routine use, the instruments were immersed in the solution for 10 minutes, removed, washed in running tap water and dried with a clean towel. Samples of the disinfecting solutions were taken at the end of 2, 4, 8, 12, and 24 hours for culturing. These samples were observed to contain appreciable amounts of hair, dandruff, and other debris. Even under these routine conditions the 1:500 dilutions of phemerol and hyamine with trisodium phosphate proved effective, since all cultures were entirely negative.

Fresh preparations of the two disinfectants were prepared daily and given the station barber for use under routine conditions, each agent being in use for 6 days. No cultures were taken but the barber was asked for comments concerning the routine use of the disinfectants. The barber had no unfavorable comment or criticism to make concerning the disinfecting procedures. The method was found to be simple and easy to use, had no deleterious effect on the instruments and no toxic effect to the hands of the barbers. The customers made no complaint.

Cultures of various organisms encountered on the instruments during the entire period were studied and classified according to genus or group (table 2).

TABLE 2.—*Total number and types of bacteria and fungi encountered in culturing barbers' instruments*

Cultures	Morphology	Gram stain	Hemolytic properties	Genus or group
722	Coccal	Positive	Negative	Staphylococcus.
6	Coccal	Positive	Positive	Staphylococcus.
18	Coccal	Negative	Negative	Micrococcus.
99	Bacilliform	Positive		Subtilis.
9	Bacilliform	Negative		Pseudomonas.
15	Bacilliform	Negative		Coliform.
1	Bacilliform	Negative		Alcaligenes.
84	Fungal			Pichia.
7	Fungal			Penicillium.
5	Fungal			Alternaria.
4	Fungal			Mycella.
4	Fungal			Torula (colored).
4	Fungal			Candida.
4	Fungal			Aspergillus.
3	Fungal			Saccharomyces.

SUMMARY AND CONCLUSION

1. A series of experiments was conducted to determine the acceptability of phemerol and hyamine concentrates as routine disinfectants of barbers' instruments. After establishing the probable normal bacterial and fungal flora on instruments in use at the station barber shop, various tests were conducted to obtain information concerning the following points:

(a) Effective strengths and a suitable exposure period for the agents on instruments after routine use.

(b) The value of adding trisodium phosphate as a detergent to the disinfecting solutions.

(c) The effectiveness of the agents against known bacterial and fungal cultures.

(d) Possible deleterious action on the instruments or toxic effect on human tissues.

(e) The duration of effectiveness of the disinfectants when mixed with trisodium phosphate.

(f) The ease and simplicity of using the procedure under routine conditions in the shop.

2. It was found that either phemerol or hyamine concentrates in a dilution of 1:500, when mixed with the detergent trisodium phosphate in a final concentration of 0.8 percent, completely destroyed the viability of all bacterial and fungal organisms encountered when the exposure time was 10 minutes. In the experiment with known stock cultures, a significant increase in effectiveness was observed when

trisodium phosphate was used as compared with parallel tests without the detergent. In view of the fact, however, that under routine conditions in the shop, soap and debris are likely to be introduced into the solution it is believed that higher dilutions of the two agents might not provide a desirable margin of safety. It is possible also that other chance variations in the demand on the disinfectants might result in incomplete effectiveness at higher dilutions.

Activity of such dilutions remained effective during the 24-hour period including 8 hours of routine use in the shop. The procedure adopted for shop trials was to immerse the instruments in the solution for 10 minutes following use, after which they were rinsed in running tap water and dried with a clean towel. The method was found to be satisfactory in the barber shop from the standpoint of ease and simplicity of operation.

3. It was concluded, therefore, that the method described above met the essential requirements for an acceptable procedure in the routine disinfecting of barbers' instruments.

4. The following instructions indicate the procedure to be followed:

(a) Prepare a 1:500 dilution of phemerol concenerate or hyamine concentrate daily in distilled water with trisodium phosphate added in a concentration of 8 gm./1000 ml.

(b) Wash instruments free of soap in running tap water, immerse in the solution for a period of 10 minutes, then rinse in running tap water and dry with a clean towel.

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SPECIAL ARTICLE



EXCERPTS FROM ANNUAL REPORT OF THE SURGEON GENERAL

(Fiscal Year 1948)

During the fiscal year 1948, in a background of domestic inflationary trends, the "cold war," federal budgetary retrenchments, and personnel shortages, all medical facilities and services were maintained in a state of adequate peacetime readiness, and serious attention was given to planning for medical department needs in the event of a national emergency. Coordination of the medical and hospital services of the three Armed Services was maintained.

MEDICAL FACILITIES

THE FLEET

Of the six hospital ships in commission two are in active status, one in the Atlantic and one in the Pacific. Four are in the Reserve Fleet, two in the Atlantic and two in the Pacific.

THE SHORE ESTABLISHMENT

At the end of the fiscal year, 30 naval hospitals, of which 4 were outside the continental United States, remained in operation. Two naval hospitals were disestablished. The operational bed capacities of naval hospitals were modified to meet changing logistic requirements, and the total authorized bed capacity was reduced from 24,600 at the beginning of the year to 19,725 on 30 June 1948.

Construction of the 300-bed hospital at Beaufort, S. C., is nearing completion. Bids for contracts for erection of the new St. Albans (N. Y.) Naval Hospital have been requested and it is expected that construction will begin during the next fiscal year. Construction of a \$25,000,000 naval hospital on Guam, M. I., was authorized by Congress and \$5,000,000 appropriated as the first increment.

The U. S. Naval Dispensary, San Francisco, Calif., was established.

With the closure of the U. S. Naval Hospital, Dublin, Ga., the Rheumatic Fever Research Unit was transferred to and established at the Naval Training Center, Great Lakes, Ill., as U. S. Naval Medical Research Unit No. 4.

Disestablishment of the U. S. Naval Medical Supply Storehouse, Norfolk, Va., the last of the wartime medical storehouses, left four naval medical supply depots for the receipt, storage, issue and distribution of naval medical material.

Eight epidemiology units continued to function—seven in the United States and one overseas. The duties of the units remained the same, i. e., to maintain a constant check on factors that bear on the health of naval personnel, to investigate outbreaks of disease in the Naval Establishment, and to conduct research projects.

Sixty-two naval photofluorographic units were located in this country and abroad.

There were six medical research facilities under the management control of the Bureau of Medicine and Surgery, three under the management control of the Bureau of Aeronautics, two under the management control of the Bureau of Ships, and one under the Department of the Army.

UNDER BUREAU OF MEDICINE AND SURGERY MANAGEMENT CONTROL

1. U. S. Naval Medical Research Institute, National Naval Medical Center, Bethesda, Md. (This institute conducts basic and applied research in the biological sciences.)

2. U. S. Naval Medical Research Laboratory, Submarine Base, New London, Conn. (Conducts research on physiologic, psychologic and medical problems in submarine and diving operations.)

3. U. S. Naval Medical Field Research Laboratory, Marine Barracks, Camp Lejeune, N. C. (Conducts basic and applied research on medical problems pertaining to the Navy and Marine Corps in the field.)

4. U. S. Naval Medical Research Unit No. 4, U. S. Naval Hospital, Dublin, Ga. (Transferred to Naval Training Center, Great Lakes, Ill. at the beginning of fiscal year 1949.) (Conducts research in rheumatic fever and streptococcal diseases.)

5. U. S. Naval Medical Research Unit No. 3, Cairo, Egypt. (Conducts research of a basic nature on diseases which are endemic and epidemic in the Middle East.)

6. U. S. Naval Medical Research Unit No. 1 Life Sciences Buildings, University of California, Berkeley, Calif. (Conducts research on air-borne infectious diseases.)

UNDER MANAGEMENT CONTROL OF BUREAU OF AERONAUTICS

1. U. S. Naval School of Aviation Medicine and Research, Naval Air Station, Pensacola, Fla. (Conducts research on problems in the field of Aviation Medicine.)
2. Aero-Medical Laboratory, Naval Air Experimental Station, Naval Air Matériel Center, Philadelphia, Pa. (Conducts studies involving aviation equipment, and personnel protection.)
3. Physiological Test Section, Service Test Division, Naval Air Test Center, Naval Air Station, Patuxent, Md. (Conducts tests on aviation personnel equipment under flight conditions.)

UNDER MANAGEMENT CONTROL OF BUREAU OF SHIPS

1. Naval Radiological Defense Laboratory, San Francisco, Naval Shipyard, Calif. (Conducts studies on radiological safety and atomic defense.)

UNDER MANAGEMENT CONTROL OF DEPARTMENT OF THE ARMY

1. U. S. Naval Unit, Biological Division, Chemical Corps, Camp Detrick, Frederick, Md. (Conducts chemical and biologic research and development.)

DENTAL FACILITIES

The Naval Dental Prosthetic Clinic, Naval Gun Factory, Washington, D. C., was established 15 October 1947 under a Dental Officer in Command to provide dental prosthetic treatment for naval and Marine Corps personnel in the Washington, D. C., area. To train dental enlisted personnel, three new dental technician schools were established: one at the National Naval Medical Center, Bethesda, Md.; one at the Naval Training Center, Great Lakes, Ill.; and one at the Naval Training Center, San Diego, Calif.

PERSONNEL**PROCUREMENT**

The nation-wide shortage of medical personnel had a counterpart in the Navy in a shortage of medical and dental officers and nurses. However, a definite decline in resignations of doctors and nurses was noted, while personnel procurement activity showed improved results in recruitments, as well as transfers to the Regular Navy.

A procurement program was inaugurated to interest civilian physicians and Reserve medical officers in a naval career by offering post-graduate instruction in naval and civilian activities. Physicians are placed under internships in civilian institutions as well as in naval hospitals. Approximately 300 physicians will be placed under post-graduate instruction, 200 in their chosen specialties in civilian institutions for training varying from 1 to 3 years' duration, and 100

in naval residencies. Physicians assigned by the Navy to civilian internships, and both naval and civilian residencies, are required to serve proportionate periods of active duty in the naval medical service for each year of training received. Direct contact has been maintained with accredited medical, dental, and nursing schools, and procurement contacts and programs have been accelerated via the press, radio, and television, and by Bureau of Medicine and Surgery representatives appearing before professional organizations.

The Army-Navy-Public Health Service Medical Officer Procurement Act of 1947, approved 5 August 1947, was designed to meet an urgent need for additional physicians and dentists. It provides additional pay and also makes provision for initial appointment of such personnel in ranks up to and including captain in the Navy. But for this Act it is believed that the shortage of medical and dental officers in the Navy would be far greater than it is today. This Act has had the effect of bringing resignations to a virtual standstill and at the same time inducing a considerable number of medical and dental officers to request active duty.

AVIATION MEDICINE PERSONNEL

There will not be sufficient flight surgeons available to fill all billets. With the release of 60 flight surgeons who received their medical training under the V-12 program, the shortage will become more acute. In order to provide specialized training of medical officers in aviation medicine, the operation of the School of Aviation Medicine and Research at Pensacola, Fla. is being continued.

The need for allied medical sciences personnel such as physiologists and psychologists, continues to be great.

SUBMARINE MEDICINE PERSONNEL

The Submarine Division devoted considerable time and effort toward the procurement of additional medical officers for manning the presently authorized billets. Despite all efforts to stimulate interest there were no applicants for submarine medical training from medical officers of the Regular service. Therefore, officers of the Reserve (V-12's) currently serving obligated time were detailed. Twelve Reserve medical officers were assigned to the established training course for submarine medical officers.

A Board to consider the qualification of submarine medical officers has been maintained.

EFFECT OF SELECTIVE SERVICE LAW

The application of the Selective Service Law is expected to have little or no effect on procurement of medical personnel. It is, however, the basis for a marked increase in the work load of military and civilian Medical Department personnel.

TRAINING (OFFICER AND ENLISTED)

The Bureau has engaged in an extensive training program for officers and enlisted personnel of the Medical, Dental, Medical Service, Nurse, and Hospital Corps.

Training of Medical Department personnel is carried out in nine naval hospitals and many outstanding civilian universities, hospitals, and clinics. Training periods vary from short refresher courses to periods of 6 months, 1 year, 2 years, and 3 years' duration. Personnel assigned to courses of 6 months' duration or longer are required to sign a service agreement to insure naval benefits from their training.

As of 30 June 1948, there were 392 Medical, 25 Dental, 34 Nurse, 33 Medical Service, and Hospital Corps officers, and 1,601 enlisted Hospital Corpsmen under training.

An integral part of the training for Medical Department personnel consists of a special service for audio-visual training. This service provides medical training films for use by the naval service; maintains facilities to permit utilization of naval medical films by other Government agencies, civilian medical and allied professions, and related teaching institutions; plans and displays naval medical exhibits; coordinates training efforts relative to the use of medical training films; and represents the Navy Department on the Interdepartmental Committee for the Coordination of Medical Training Film Production.

The loan of medical films to civilian physicians and institutions has increased markedly during the past year. A total of 14 films were completed during the year and 5 are in process of production.

Over 250 medical officers were trained in short courses (5 to 15 days) in atomic defense. Four officers of the Medical Department completed intensive training in the medical aspects of atomic energy, hazards of nuclear radiation, and radiological safety; one Medical and one Medical Service Corps officer commenced on-the-job training in Atomic Energy Commission laboratories.

One medical officer has been detailed to teach radiological defense at the Damage Control School, Treasure Island, Calif. A course in medical aspects of atomic defense at the Naval Medical School was arranged by the Atomic Defense Division under the auspices of the American College of Physicians. Sixty medical officers participated in this course. Training of photo-dosimetrists has been continued at the Naval Radiological Defense Laboratory, and similar instruction has been included in the curriculum for technicians at the Naval Medical School, Bethesda, Md.

The medical exhibit on Operation Crossroads was shown three times during the year to approximately 250,000 persons, including 500 physicians at the Texas State Fair at Dallas; 2,000 physicians at the

New Orleans Graduate Medical Assembly; and 2,000 physicians at the Ohio State Medical Society Convention in Cincinnati. Many training lectures in radiological safety were given by various members of the Atomic Defense Division, to students of the Naval Academy, Army Chemical School, Naval Dental School, Naval Medical School, and Volunteer Medical Reserves. Assistance was also rendered the Army Medical Department in courses in radiological safety at Walter Reed Hospital.

Over 20 medical officers were trained in photofluorographic interpretation.

Thirty Medical Service and Hospital Corps officers completed a special course in sanitation, venereal disease control, and rodent control at the University of California. These officers have been assigned to Naval Districts and large stations. One medical officer completed a course in venereal disease control at Johns Hopkins University, Baltimore, Md. During the year 10 medical officers have been trained in dermatology and syphilology; 1 medical officer completed work toward the degree of Doctor of Public Health, 1 received the degree of Master of Public Health, 1 medical officer began a course in virus diseases at the Johns Hopkins University, School of Hygiene and Public Health. Arrangements have been made for courses in preventive medicine for fiscal year 1949 leading to the degree of Master of Public Health for 3 medical officers, and for a course in virus diseases for 1 medical officer. The commanding officer of one unit started a course in sanitation at the University of California. One Reserve Medical Service Corps officer was called to active duty for field training in one of the epidemiology units during the summer of 1948.

Since the establishment of rating Group XI Dental, headed by Warrant Officer Hospital Corps (which became effective 2 April 1948), the percentage of dental personnel reenlisting in the Navy has been increased from 30 percent reenlistments to 50 percent. Plans have been completed for continuing the training of dental enlisted personnel after the completion of courses in the dental schools previously mentioned. A basic handbook for dental technicians, to serve as the standard text for instruction, and study guides for advancement in dental group ratings are nearing completion. A separate study guide will assist dental technicians in each grade to prepare for advancement examinations.

The Naval Dental School has continued to provide postgraduate instruction in general dentistry, prosthodontia, and oral surgery for officers of the Regular Dental Corps. In addition, training courses of 2 weeks' duration have been given to inactive Reserve dental officers in all naval districts and to undergraduate dental students who hold

Naval Reserve commissions. It is planned to continue these courses during the next fiscal year.

A naval dental internship program has been established, and the first class of dental interns is scheduled to report in August. It is anticipated that this program will enhance the already high professional standard of the Naval Dental Corps and so attract dental graduates to careers in the Navy.

During the fiscal year a number of dental officers received graduate and postgraduate instruction at civilian institutions, but owing to the growing shortage of dental personnel, the majority of courses were of the brief refresher type. Eleven dental officers attended long courses and 64 attended short courses. Two officers of the Dental Corps received advanced instruction at the National Bureau of Standards, one at the Industrial College of the Armed Forces, and one at the Naval War College.

RESERVE COMPONENTS (MEDICAL DEPARTMENT)

The Volunteer Medical Division program for Reserve medical personnel has been in effect since 1947. Each Volunteer Medical Division consists of 75 Medical, 15 Medical Service, 50 Nurse Corps officers, and 250 Hospital Corps personnel. The activities of these Reserve Medical Divisions are correlated with the Reserve Dental Units. A corresponding plan for Reserve Dental Units is also in effect. Responsibility for maintenance and training of Volunteer Medical Divisions is placed on the District Medical Officer. Naval Reserve Dental liaison officers are responsible for dental components. Reserve medical divisions and dental units are placed geographically to accommodate the largest number of Reserve personnel. In the training program for Medical Department Reserves, emphasis is placed upon special instruction in subjects distinctive to military medicine. This entire program is aimed at the activation of highly qualified, physically fit, Medical Department Reserve components, the members of which will receive such training while inactive as will prepare them for efficient active duty, as well as to provide effective personnel for military and civilian defense.

PROMOTION POLICIES AND FACTORS, AND EFFECT OF NEW LAWS

Several laws directly affecting components of the Medical Department are noted:

1. The Army-Navy Nurses Act of 1947, was approved 16 April 1947. The effect of giving nurses officer status has been to boost the morale of the Nurse Corps and to make nursing in the Navy a far more attractive career. Without this law, it is doubtful whether the Nurse Corps would now have sufficient personnel.

2. The Army-Navy Medical Services Corps Act of 1947, approved 4 August 1947, made provision for a new Corps within the Medical Department by giving permanent officer status to former enlisted personnel of the Hospital Corps, as well as to selected pharmacists, optometrists, and allied medical sciences personnel. The effect of attracting such professional men and enlisted personnel for commission in the Medical Department has been salutary.

3. The effect of the Naval Dental Service Act, approved 28 December, 1945, has been to improve the efficiency of the dental service. Further applications and interpretations of this law were implemented during the fiscal year 1948.

4. The Officer Personnel Act of 1947, approved 7 August, 1947, provides for selection for promotion and retention of naval officers on active duty. The effects of this Act have been under constant study.

5. The Women's Armed Services Integration Act of 1948, approved 12 June 1948, provided for the first time in the history of the Navy, for permanent officer and enlisted status for women, in addition to that already provided for nurses. It is believed that through the utilization of the services of women under this law the efficiency of the Medical Department will be increased, particularly in connection with the care and treatment of the dependents of naval personnel.

MEDICAL PROGRESS AND NEW DEVELOPMENTS

Scientific and logistic medical progress in support of the Navy's requirements was accomplished in close liaison with the medical services of the other Armed Forces, the Medical Departments of the Veterans' Administration and the U. S. Public Health Service, the National Research Council, the Atomic Energy Commission, other closely allied agencies, and the civilian medical profession.

Continuing attention has been given to the procurement of newly developed drugs and antibiotics.

SUBMARINE MEDICINE

The Director of the Submarine Medicine Division collaborated with representatives of the Bureau of Ships and the Bureau of Ordnance in the preparation of Safety Codes and to devise additional means for personnel protection, and sanitation in submarines.

Active liaison was maintained with the Coordinator of Undersea Warfare in Naval Operations in order to promptly recognize and bring about the solution of medical and preventive medical problems of the Submarine Forces; and with the Salvage Section of the Bureau of Ships for determination of the medical needs, training requirements and standards in deep-sea diving.

Efforts have continued toward improving the helium-oxygen diving techniques and equipment. Recent accidents have been studied and their countermeasures proposed.

Work has continued on the study of the effect of snorkelling on submarine personnel and the development of equipment and techniques for combatting conditions adversely affecting the health and habitability of personnel.

In conjunction with the Bureau of Ships, studies have been carried out on the air supply in the submarine; the oxygen and CO₂ concentration; and on the elimination of undesirable and offensive odors resulting from vapors incident to meal preparation and foul air emanating from the sanitary tanks.

Fatigue in operating personnel as a result of operational requirements of the newer type vessels is currently receiving intensive study.

PREVENTIVE MEDICINE

Recent advances in the control of virus diseases have been made by civilian specialists. Two medical officers are under training in virus disease and its control.

Joint studies with the Army for evaluation of influenza vaccine, and evaluation of the control of respiratory diseases by sterilization of air in barracks was continued.

Tuberculosis control in naval establishments was carried out by means of chest roentgenograms of all military and civilian employees in continental naval establishments, and tuberculin testing of all recruits.

There were 54 stationary photofluorographic units located in shipyards, receiving stations, training centers, and hospitals. In addition, six mobile photofluorographic units were available for smaller naval activities and NROTC units. Inclusion of civilian employees in the annual survey has taxed these mobile units to the point that it is now impossible to completely survey each naval district annually. Plans are now under way for procurement of additional mobile photofluorographic units in order that by fiscal year 1950, one may be assigned to each continental naval district.

An additional stationary photofluorographic unit was installed at U. S. Naval Hospital, Key West, Fla. Two transportable photofluorographic units, which can be easily carried by land, sea, or air were obtained for use in ComFIFTEEN and ComTEN. A similar unit is under procurement for ComFOURTEEN.

The effects of streptomycin in the treatment of tuberculosis was studied in certain naval hospitals.

New directives on venereal disease control place responsibility for this function on the commanding officer, and puts greater emphasis on improved morale and clean living.

Negro hospitalmen were trained in interviewing venereal disease contacts and also in VD control.

A form of penicillin recently developed will give effective blood levels for from 4 to 7 days with a single injection. It will soon be procured by Matériel Division, and it is hoped that the treatment of syphilis can be completed in 10 days without hospitalization, and the treatment of contacts with a single injection.

The Bureau of Medicine and Surgery, in conjunction with the Bureau of Aeronautics, took part in planning and facilitating tests for controlling mosquitoes and flies by DDT fog generators; for better insecticide dispersal from airplanes; and for perfecting a single-control apparatus for disinsectization of aircraft in flight. In the amphibious exercises at Vieques, a village was cleared of all mosquitoes and flies in 1 hour by means of a DDT fog machine mounted on a truck.

The phenomenon of "No growth" in the cultures of stools from men who remained well in dysentery epidemics, which indicated an unknown antibiotic in the intestine of some personnel, was first noted by a naval medical officer in charge of an epidemiology unit. He was encouraged and assisted in the study of this phenomenon.

INDUSTRIAL HEALTH AND SAFETY

Continuous effort has been made to recruit personnel to fill authorized civilian industrial hygienist billets at major shore activities. Prospects for filling all billets at an early date appear bright.

Safety surveys were conducted at 14 naval hospitals. A safety manual is being prepared. A training course in safety engineering has been prepared for the U. S. School of Hospital Administration.

The Bureau directed the installation of explosionproof wiring and sparkproof decks for all major operating rooms. In cooperation with Office of Industrial Research, corrective glasses in safety goggles are to be supplied.

An analysis of accident statistics obtained from the Safety Division, Office of Industrial Research, showing occurrence, causative agents, and corrective applications, was completed and furnished to medical field activities.

MEDICAL ASPECTS OF ATOMIC ENERGY

The Atomic Defense Division of the Bureau of Medicine and Surgery completed radiological clearance of all contaminated Crossroads nontarget vessels, in conjunction with the Bureau of Ships, and assisted in the planning and completion of Operation Sandstone. Vessels in this operation were given radiological clearance when they met selected monitoring standards. The Radiological Health Laboratory at Pearl Harbor, T. H., was reverted to caretaker status as a result of the completion of Operation Crossroads, and the Radiological Health Laboratory on Kwajalein was decreased in size and now requires no medical officers.

Radiological Safety Regulations were prepared and issued to the entire naval service and a revised and amplified Manual of Radiological Safety was published for general use.

Research activities in the medical aspects of atomic energy have been carried on continuously at the Naval Radiological Defense Laboratory, San Francisco, Calif., and the Naval Medical Research Institute, Bethesda, Md.

NEUROPSYCHIATRY

Particular attention has been given to the further development of psychiatric services in keeping with the recent advances in this field. It was noted that Navy patients requiring psychiatric care are either primarily psychotic or prepsychotic in contrast to the heavy proportions of neurotics during and shortly after World War II. Attendant medical services and treatment have required corresponding adjustments. In keeping with current Navy requirements and in order to develop a strong clinical psychology program, arrangements have been made for the care of mental cases at the U. S. Naval Hospital, Houston, Tex.

There were 74 psychiatrists on active duty, of whom 68 were Regular Navy and 6 Naval Reserve officers. This represents an over-all loss of 12 percent of the psychiatrists as compared with the previous fiscal year. Applications for transfer from Reserve to Regular Navy were approved for 13 psychiatrists. Thirty-two psychiatrists were in post-graduate training at the end of the fiscal year and 10 had completed training; of these, 4 have passed the American Boards. Personnel needs in psychiatry are still critical and an active procurement program has been initiated.

The neuropsychiatric patient census has averaged 1,215 during the fiscal year. Twenty-nine naval hospitals in the continental United States have neuropsychiatric services. Each Navy psychiatrist has treated on the average 503 new neuropsychiatric patients during the fiscal year. In addition, in most activities their duties included the training of psychiatrists under instruction, consultation with other medical services, and a heavy outpatient service.

PHARMACY

A survey of 247 Navy activities rendering pharmacy service was completed. These activities dispensed an average of 6,496 prescriptions and prepared an average of 3,393 ward orders per day. Combined, these services represent an average of 9,855 operations per day. An estimated shortage of 200 trained pharmacy technicians exists. Action has been initiated to improve present pharmacy services, and also to fill vacant Medical Service Corps billets in pharmacy.

CASUALTY HANDLING AND COMBAT MEDICINE

Continuous attention is being given to methods of evacuation and handling of casualties. Under present conditions evacuation by air, almost to the exclusion of any other means, has been used for Navy personnel.

The Naval Field Medical Matériel Board has completed recommendations for modernizing and streamlining field medical equipment in order to provide better and more mobile field medical facilities.

As a result of experiences gained in the Texas City disaster, completely equipped surgical trailers and accompanying electrical generators were furnished to each naval district in the continental limits, to be immediately available for use in emergency.

To implement the medical support of major combat units, an Amphibious and Marine Corps Field Medicine Division has been established in the Bureau of Medicine and Surgery.

HOSPITALIZATION

For the period covered by this report, the Hospitalization Branch has made 1,916 interdistrict transfers of patients requiring specialized treatment, as compared to 2,915 similar transfers made during the previous fiscal year. It is believed that this decrease may be attributed in no small part to the benefits derived from the specialty training program for medical officers.

During the last 6 months, the Hospitalization Branch represented the Bureau of Medicine and Surgery on the Subcommittee on Medical Services for Dependents of the Committee on Hospital and Medical Services of the Armed Forces. As a result of the joint studies and recommendations of this subcommittee reciprocal medical care for dependents by the Medical Services of the Armed Forces is anticipated.

PHYSICAL QUALIFICATIONS AND MEDICAL RECORDS

PHYSICAL STANDARDS IN SUBMARINE RESERVE UNITS

The Naval Reserve training program and the high-school graduate training school procurement have necessitated considerable effort by the Submarine Medicine Division to provide adequate personnel in screening candidates for the various submarine reserve units. Periodic screening is necessary in order to eliminate those mentally and physically unfit for submarine duty. Many of the submarine reserve units have no qualified medical officer. Many units have no medical personnel whatsoever. In view of the latter, it has been necessary to compile instructions for use by lay personnel, so that such personnel could carry on screening in units not provided with trained medical assistants. New billets for submarine medical officers in both the

Submarine Force, Pacific Fleet, and the Submarine Force, Atlantic Fleet, have been created to provide trained medical personnel for the large central activities.

MEDICAL, DENTAL, AND RELATED RESEARCH

Research continues to play a major role in the program of the Medical Department. Strenuous efforts have been made to secure trained research workers and technicians in all sciences relating to medicine. There is a shortage of administrators in medical research.

<i>Research program</i>	<i>Number of projects</i>
Theoretical and laboratory explorations and experimentation in the medical, biological, and physical sciences.....	8
Aviation medicine.....	32
Submarine and diving medicine.....	8
Physical standards and fitness of personnel.....	30
Environmental stresses and adjustment of personnel.....	2
Preventive medicine.....	20
Prevention and treatment of diseases and injuries from weapons of warfare.....	4
Practice of medicine and surgery.....	25
Practice of dentistry.....	6
Rehabilitation of disabled personnel.....	4
Physiological evaluation of military equipment and supplies.....	8
Development and evaluation of military equipment and supplies.....	6
Development of equipment and procedures for research.....	5
Total.....	158

Some of the important projects studied during fiscal year 1948 are as follows:

- Studies on malarial parasites.
- Disorientation in pilots.
- Physiological effect of high altitudes.
- Biomechanics of aviation crash injuries; protective measures.
- High accelerations.
- Physiological limits of escape from high altitudes.
- "Bends" at high altitudes.
- Procedures for selecting aviation trainees.
- Health hazards in operating engine test cells.
- Physiology of decompression sickness.
- Effects of Snorkelling on personnel.
- Studies on vision.
- Studies on color vision.
- Auditory problems.
- Physiological effects of vibration.
- Studies on schistosomiasis.
- Role of insects in transmission of virus diseases.
- Ultraviolet radiation in naval barracks.
- Control of streptococcal diseases.
- Diarrheal diseases and dysenteries.

- Insect eradication.
- Prevention of tick-borne diseases.
- Studies on rheumatic fever.
- Oral penicillin as a VD prophylaxis.
- Studies on antimalarial compounds.
- Studies on typhus fever.
- Streptomycin in tuberculosis.
- Protective and therapeutic measures for burns.
- Medical aspects of thermal and ionizing radiations.
- Diet and dental caries.
- Hand and digit prosthesis.
- Use of radioactive isotopes in medical research.

In addition, there were several projects on basic medical research supported jointly by Bureau of Medicine and Surgery and Office of Naval Research through contracts with civilian universities; joint participation with the Department of the Army supporting research by the Department of Agriculture on insect and rodent control and eradication; joint projects with Bureau of Aeronautics in aviation medical problems, participation with the Army in chemical warfare projects, and with Bureau of Ships on radiological safety projects.

Throughout the year there has been valuable interchange of ideas and information on research with other Bureaus of the Navy, with other Armed Services and Governmental Agencies, and civilian institutions through panels, committees, conferences, symposia and meetings of scientific societies.

During the fiscal year 1948, 138 reports on research projects were published and distributed to Bureaus, field activities, and to interested units of the Army, U. S. Public Health Service, and other Federal agencies, as well as to civilian research workers. Through these reports, published in various scientific journals, the work of the investigators in naval medical research has become widely known not only in the Armed services, but by scientists in related fields and in civilian industry.

The total research appropriation for the fiscal year 1948 was \$2,519,742. The total amount of expenditures and obligations was \$2,618,340, of which \$911,071 was allocated to civilian institutions through Office of Naval Research contracts.

The future program will be the continuance of projects now under way, and other related projects.

In general the following important programs will be implemented:

- Studies on noise and air blast.
- Study of biological and chemical substances utilizing advanced techniques.
- Studies on free falls and parachute descents.
- Body armor—wound ballistics.
- Physiological limits of escape from aircraft.
- Field use of DDT and other insecticides with emphasis on combat usage.

Rheumatic fever.

Study of major incapacitating diseases in naval recruits.

Amphibious combat medicine.

Oral penicillin in VD prevention.

Trials of new dysentery vaccine.

Disorientation in flying.

Acceleration and deceleration effects on man, using the human centrifuge.

Selection tests for aviators.

Studies on human engineering in high-speed aircraft.

Biological effects of ultra-sonic vibration.

Use of radioactive isotopes in medical research.

A naval medical unit is engaged in significant investigations of tropical diseases in connection with the Wendell Phillips-University of California African Expedition, which by 30 June 1948 had reached the center of the African continent in a Cairo to Cape Town safari.

Aviation medical research has assumed growing importance as a result of the engineering advances in aircraft. Basic research will be continued at the Naval Medical Research Institute and to some degree at the School of Aviation Medicine and Research at Pensacola, Fla., while the practical application of research findings will be studied at Pensacola, at the Naval Air Material Center, Philadelphia, Pa., and at the Physiological Test Section, Naval Air Test Center, Patuxent River, Md. Full use is being made of the Committee on Aviation Medicine of the National Research Council as well as other civilian institutions through the Office of Naval Research. Construction of the human centrifuge at Johnsville, Pa., and the erection of a catapult for studies on acceleration-deceleration is under way. Further studies in the health hazards associated with jet engines and escape from high-speed aircraft are also being conducted.

DENTAL STATISTICAL RESEARCH

Studies in dental statistics have had three major objectives during the fiscal year 1948: (a) to determine the number of dental officers required in each specialized branch of dental practice in the Navy; (b) to determine the ratio of dental treatment completed to that required by naval and Marine Corps personnel; (c) to assist in determining the most efficient distribution of dental billets in the Personnel Allocation Plan.

MATÉRIEL

The Naval Medical Matériel Office was established at Brooklyn, N. Y., by Secretary of the Navy on 30 March 1948. This activity is now operating as the Bureau of Medicine and Surgery matériel supply-demand control point.

Studies undertaken during the fiscal year 1948 were:

1. Physical establishment of war reserve of medical and dental materials.

2. Complete revision of all initial allowance lists for naval vessels and advance base medical and dental components.
3. Establishment of initial basic allowance lists for continental hospitals and naval dispensaries.
4. Current medical and dental material developments as applicable to the needs of the Naval Establishment.
5. The feasibility of joint Army-Navy and Air Force utilization of medical supply facilities.

The Bureau of Medicine and Surgery, through the Naval Medical Matériel Office, worked in conjunction with the Army and Air Force in the procurement of medical stores, establishment of joint specifications and standards through the facilities of the Army-Navy Medical Procurement Office.

MAJOR ORGANIZATION CHANGES

Several important organizational changes were made during the year to meet new developments and facilitate and improve operations. Of these special significance is attached to the establishment of an Assistant Chief of Bureau for Aviation and Operational Medicine. Organizational units directed by this Assistant Chief include: the Aviation Medicine, Submarine Medicine, Dispensary Medicine, and Amphibious and Marine Corps Field Medicine Divisions. Dispensary Medicine Division was newly established. Submarine and Amphibious and Marine Corps Field Divisions were transferred from Research and Medical Military Specialties.

This change will place the Bureau in a better position to carry out its responsibilities relative to problems arising from increased air activity and operational medicine. The Dispensary Medicine Division was created to work on problems presented by the large number of small medical and dental installations ashore and afloat.

The Preventive Medicine Division was transferred from the Professional and Personnel Operations group to Research and Medical Military Specialties. The Publications Division was placed in a staff capacity, reporting directly to the Deputy and Assistant Chief of Bureau.

Several organizational changes took place within individual divisions including the establishment of a Pharmacy Section and an Optometry Section in the Professional Division.

Although new developments will most certainly require organizational changes in the future, the present basic organizational structure is considered very satisfactory.

ADMINISTRATIVE PROBLEMS AND ACCOMPLISHMENTS

Administrative problems receiving special attention during the year included the improvement of civilian personnel administration in both

Bureau and field activities and clarification and proper staffing of the civilian personnel function; the development of an improved and uniform admission procedure for all naval hospitals; studies aimed at simplification and standardization of naval hospital organization; standardization of naval shipyard and air station dispensary organization; and, of vital significance, the procurement of adequate numbers of personnel in the various corps of the Medical Department to carry out its assigned functions. Special and further consideration is being given at the Departmental level to the possible necessity of increasing the allowance of enlisted Hospital Corps personnel, as a justified requirement of naval medical administration.

Major progress was achieved in the improvement of the professional and administrative relations between the Bureau and the naval medical activities in the field. This has been brought about by means of field trips and exchanges of personnel, and was greatly accelerated by a symposium of the Surgeon General held at the National Naval Medical Center, Bethesda, Md., which was attended by all Senior Medical and Dental officers of the service.

HEALTH OF NAVAL PERSONNEL, MEDICAL FACTORS AND STATISTICS

In calendar year 1947 mortality reached the second lowest rate ever recorded in the Navy—199 per 100,000 strength. This is only minutely lower than the rate of 201 per 100,000 experienced in 1946. It is of interest to compare the current death rate with that of a comparable year following World War I. In 1923 the death rate was the second lowest that had been recorded for the Navy up to that time, yet the current rate is less than half as high as in 1923.

TABLE 1.—*Death rates per 100,000 strength Navy and Marine Corps*

Cause of death	Year	
	1947	1923
All causes.....	199	405
Diseases.....	43	185
Injuries and poisonings.....	156	220

The reduction in deaths due to disease is most striking, but the 33 percent decline in deaths resulting from injury also is quite impressive in view of the fact that the reduced injury death rate includes an actual increase in rate for certain types of accidents (motor vehicle and aviation).

It is thus apparent that the improvement in death rate reflects major advances in prevention and treatment of diseases and injuries and that these advances are effective in preserving the Navy's manpower in peace as well as war.

As further noted under "Naval Medicine," the personnel of the Navy and Marine Corps continued to set a record of good health as reflected in a low rate of incidence for all diseases and injuries. In calendar year 1947 the major phases of demobilization had been completed, and, while an appreciable degree of turn-over in personnel took place, it was the most stable year in this respect since 1939. Morbidity conditions associated with recruit training and separation centers were thus more nearly normal. During the year the disposition of long-term patients remaining from the wartime Navy was essentially completed, so that the patient load became more closely proportioned to the current strength of the Navy.

The factors present in the continued low rate of incidence of disease in the Navy are most significant within the group of major communicable diseases. There was an appreciable decline in the rate for diseases transmitted by oral and nasal discharges, which group includes the common cold and other common upper respiratory diseases as well as most of the acute contagious diseases. The rate dropped from 118.0 per 1,000 strength in 1946 to 100.0 in 1947. This decline can be attributed at least in part to the fact that the Navy had fewer activities with large concentrations of personnel in the current year, since this class of diseases tends to be more prevalent among large groups living in close contact.

The incidence rate for tuberculosis dropped from 3.0 per 1,000 in strength in 1946 to 1.8 in 1947. In this connection it must be pointed out that the incidence of tuberculosis has been markedly influenced by the Navy's intensive case-finding program by chest roentgenogram. The reduced incidence rate for the current year is still higher than that experienced in 1945, but it indicates the discovery of many cases prior to the onset of symptoms. While the effects of the program may show as a temporarily increased incidence rate, due to the inclusion of symptomless cases, the ultimate result is favorable both to the individual and to the Navy.

The venereal disease picture may be presented better on a monthly than on an annual basis. The annual incidence rate per 1,000 strength was 85.8 in 1947 as compared with 71.1 in 1946. These figures do not indicate the trend because of the fact that the strength of the Navy was changing quite rapidly during 1946. The monthly incidence rates show that the peak (109.6 per 1,000 strength per year) was reached in October 1946, and that there was a steady decline during 1947 from 101.8 in January to 71.6 in December.

The leading 10 individual causes of incidence are shown in the following table. It is noteworthy that 9 of the 10 conditions were included among the 10 leading causes of incidence in 1946 also, and that the same 4 diagnoses led the list in both years.

TABLE 2.—10 leading causes of incidence—1947 Navy and Marine Corps

Diagnosis	Case incidence	Rate per 1,000	Percent of total incidence
Gonococcus infection, urethra	41,744	71.44	14.43
Catarrhal fever, acute	32,409	55.46	11.20
Tonsillitis, acute	10,837	18.55	3.74
Cellulitis	10,184	17.43	3.52
Fracture, simple	7,594	13.00	2.62
Tonsillitis, chronic	7,502	12.84	2.59
Gastroenteritis, acute	6,009	10.28	2.08
Pharyngitis, acute	5,463	9.35	1.89
Syphilis	5,040	8.62	1.74
Redundant prepuce	4,736	8.10	1.64

EFFECTS OF MORBIDITY ON MANPOWER

An important statistic in evaluating the effects of illness on the Navy's manpower is the noneffective ratio, which indicates the average number of men per 1,000 strength who are daily on the sick list. The noneffective ratio improved from 31.4 per 1,000 in 1946 to 26.4 in 1947. Thus, of every 1,000 men on active duty there were 5 fewer noneffectives due to illness in 1947 than in the previous year. This is equivalent to a gain of nearly 3,000 effective personnel in 1947, when manpower shortages were acute throughout the service.

The average number of sick days per case incidence dropped from 23.3 in 1946 to 19.6 in the current year. A part of this reduction was due to the final disposition of the major portion of the long-term cases remaining from the wartime Navy. The average number of sick days per case incidence is now seen to approach the prewar norm.

Another factor concerned with the maintenance of the Navy's manpower is the rate of invalidings from the service. This rate also improved, dropping from 28.8 per 1,000 in 1946 to 20.8 in 1947. During the war, neuropsychiatric cases were responsible for about one-third of the total number of invalidings, but this year as well as in 1946 the ratio has fallen to approximately one-fourth of the total.

The marked decline in hospital loads which began with the cessation of hostilities continued in diminishing degree into 1947. During the year there were just over 4 million hospital sick days, as compared with 12 million in 1946. This is equivalent to 7.1 days for each person in the Navy against 9.2 days in 1946. The average stay in hospital per individual patient declined from 41.6 days in 1946 to 38.7 in the current year.

TRENDS IN FISCAL YEAR 1948

The foregoing data and comments apply to the calendar year 1947, which is the latest complete year for which detailed information is available. Monthly data however permit the discussion of trends on a fiscal year basis.

The admission rate for all causes has been consistently lower during the fiscal year 1948 than in the previous year. The winter peak in admission rate reached 608 per 1,000 per year in March 1947, while the peak in fiscal year 1948 reached only to 514 per 1,000. The improvement in admission rate in the other seasons were less striking but rates were consistently lower in each quarter of fiscal year 1948.

Hospital loads have likewise been reduced during the fiscal year, from 16,714 patients on 30 June 1947 to 13,999 on 30 June 1948. The number of supernumerary patients (retired, dependents, veterans, etc.) was essentially unchanged, standing at 5,455 on 30 June of this year and 5,381 the year before. The reduction in hospital load was due to the decrease in active duty patients. The decline in number of active duty patients hospitalized was due in part to the reduction in strength of the Navy, but a part of the decrease is due to the improvement in morbidity rates and the shorter average length of stay in hospitals. At the beginning of the fiscal year 1.92 percent of the active duty personnel were in hospitals; at the close only 1.78 percent were hospitalized. These figures indicate the degree in which improved morbidity conditions and reduced length of stay in hospitals have influenced the numerical decline in active duty patient load.

The morbidity trend during the fiscal year is thus seen to be toward a somewhat lower level than that which prevailed during the previous year, and this improvement is reflected, with other factors, in the decline in active duty patient loads in hospitals.



EDITORIALS



MEDULLARY NAILING OF FRACTURES

The principles and primary objectives in the treatment of fractures are (*a*) early and correct replacement of the bone ends before the pathologic changes in the tissues become established, (*b*) maintaining the bone ends in a rigidly fixed position, and (*c*) early resumption of active function of all the joints and the injured parts. These principles are universally accepted but the best method of treatment is still to be agreed upon.

Reduction by manual manipulation followed by fixation in a plaster cast is a time-honored and valuable procedure. It has the disadvantage of not permitting early joint motion and also does not securely fix the position of the fragments after reduction.

Traction suspension provides another nontraumatic method that is readily applied. However, it will not satisfactorily bring about reduction of all fractures; it permits of only a relative fixation of the bone ends; and the method requires close and constant supervision, otherwise failures will occur. Distraction is inherent in this apparatus unless the amount of traction is judiciously applied and the effects checked by roentgenogram within 4 to 8 hours. If distraction persists, nonunion will result.

Open reduction and internal fixation by means of metal plates and screws, bone grafts, bone screws, bands, and wires, is a valuable method of treatment but is applicable only under elective conditions.

Closed reduction and external fixation, by means of such apparatus as the Roger Anderson, Griswold, Haynes, Stader, is a valuable adjunct in treatment of fractures, in the hands of those trained to use such apparatus. The devastating effects of excessive force which can be applied to the soft tissues by the readily manipulated gears and turnbuckles may be overlooked by the unwary.

In 1940 Kuentscher (1) reported his earlier experimental work in which spring steel blades were inserted into the marrow cavity percutaneously in order to bend sound bones. Although the bending pressure exerted was great, the bones not only remained straight, but actually were strengthened by the formation of a large amount of surrounding callus, apparently from the periosteum. The callus was of such size as to double the weight of the bone. This formation of callus had been previously observed by others (2) in experimental work done as early as 1775; stimulants such as heat, foreign materials, and ethereal oils were introduced into the marrow cavity. In many instances no bone destruction was observed, but instead a "simple osteitis" was noted. The reaction of the bone apparently appears as the result of stimulation exerted from within the marrow cavity (3).

As a result of his work "Callus Without Fracture," Kuentscher (3) (5) in 1940 evolved and reported still another method for the fixation of fractures which theoretically meets all orthopedic principles and objectives in treatment of fractures, utilizing a device similar to the Smith-Peterson nail. Essentially his method is to first reduce the fracture and then to introduce into the marrow cavity under roentgenologic control, a specially shaped, properly constructed, flexible nail-like steel splint from a place distant from the fracture site and without exposing the broken ends. The purpose of the nail is exactly that of the carpenter's nail. Kuentscher's "marknagel" (6) (12) is wedged into the marrow cavity and held there by friction and thus fixes the bone ends in such manner as to prevent even the slightest lateral or horizontal movement of the fracture site; no further support by plaster cast or traction is required (7). All transverse, oblique, or spiral fractures of the long bones, not less than 7 to 8 cm. from the joint in the femur and 4 to 5 cm. in the tibia and humerus, can be nailed.

To date this method has had a very limited acceptance in this country and in England. The technical development of the shape, size, and metallic content of the nail, as well as the indication for its use, is still under study (8). Only the qualified orthopedic surgeon should undertake this method of treatment, and then provided all the tools and materials required are available.

REFERENCES ¹

The translations of the following references were prepared by the U. S. Naval Technical Unit, Medical Section, Office of the Naval Advisor, Office of the Military Government, United States, under the editorial direction of Commander Harry J. Alvis (MC) U. S. N., Head of the Medical Section.

¹ A limited number of copies of these translations is available to naval hospitals. Send requests to the Editor, U. S. NAVAL MEDICAL BULLETIN.

1. KUENTSCHER, G.: Callus without fracture. *Zentralbl. f. chir.* **68**: No. 19, 1941.
2. MAATZ, R.: Importance of stimulating the marrow-cavity to the healing of nailed fractures.
3. KUENTSCHER, G., and MAATZ, R.: *Technique of Marrow Nailing*. Georg Thieme edition, Leipzig, 1945.
4. GRIESSMAN, H., and SCHUETTEMAYER, W.: Further experiences with the marrow-nailing-method of Kuentscher.
5. KUENTSCHER, G. B. G.: Progress in the field of medullary nailing. *Ann. chir. et gynaec. Fenniae*.
6. HAEBLER, C.: The stable fixation of fractures ("stabile osteosynthesis") and their economic significance. *Zentralbl. f. chir.* **70**: No. 11, 1943.
7. GRIESSMAN, H., and REICH, H.: Comparative investigations concerning the course of fracture healing with the marrow-nail (Kuentscher) and with plaster casts. *Arch. Clin. Surg.* **205**: 455-474, 1944.
8. MAATZ, R.: New nail forms for marrow nailing. *Zentralbl. f. chir.* No. 46, 1943.
9. MAATZ, R.: Significance of fat embolism in marrow nailing method of Kuentscher. *Zentralbl. f. chir.* **70**: No. 11, 1943.
10. MAATZ, R., and REICH, H.: Concerning the course of bone infection and regeneration following marrow nailing of simple and compound fractures? *Zentralbl. f. chir.* No. 8, 1943.
11. FISCHER, A. W., and REICH, H.: How great is the danger of osteomyelitis with marrow nailing of compound fractures? *Zentralbl. f. chir.* No. 8, 1943.
12. HAEBLER, C.: The indication for stabile osteosynthesis (marrow-nailing method of Kuentscher). *Monatschr. f. Unfallheilkunde*. **50**: No. 7.
13. HAEBLER, C.: Experiences with the marrow nail operation according to the principles of Kuentscher. (900 cases.) (Not previously published.)
14. Marrow nailing of gunshot fractures of the long bones at the Front, by 1st. Lt. M. D. Prof. Kuentscher.

A limited number of copies of the following translations, also prepared by the U. S. Naval Technical Unit, are available to naval hospitals, upon request to the Editor.

- A. Experiences with 221 Aneurysms, with illustrations, by Dr. H. Nusselt, Surg., Clinic of the University of Giessen. (Not previously published.)
- B. Experiences with Heller's Lattice Plastic in 100 Empyema Residual cavities treated operatively by Prof. Dr. Bernhard, Surgical Clinic of the University of Giessen. (Not previously published.)
- C. Report of the Fourth Conference of the Medical Consultants of the Wehrmacht :
 - a. Proceedings of the Consultants Committee on Pathology.
 - b. Proceedings of the Consultants Committee on Pharmacology and Toxicology.
 - c. Proceedings of the Consultants Committee on Pharmacy and Food Chemistry.
 - d. Proceedings of the Consultants Committee on Psychiatry and Neurology.
 - e. Proceedings of the Consultants Committee on Hygiene and Tropical Medicine.
 - f. Proceedings of the Consultants Committee on Tuberculosis.
 - g. Proceedings of the Consultants Committee on War Physiology.
 - h. Proceedings of the Consultants Committee on Diseases of the Teeth, Mouth, and Maxilla.

- i. Gunshot Injuries of the Brain and their Treatment.
- j. Evacuation of the Wounded.
- k. Injuries due to cold.
- l. War Nephritis.



THE USE OF STREPTOMYCIN IN TUBERCULOSIS

The Committee on Chemotherapy and Antibiotics of the American College of Chest Physicians submits the following report of the use of streptomycin in tuberculosis.

Indications for treatment.—Nearly all forms of tuberculosis respond to treatment with streptomycin in some degree. However, the drug should by no means be used indiscriminately.

Pulmonary tuberculosis.—It is extremely difficult to lay down hard and fast rules for the use of streptomycin in pulmonary tuberculosis. Especial care in the selection of cases is necessary. The drug has its greatest usefulness in cases with an appreciable amount of exudative disease. In some other cases streptomycin is responsible for symptomatic improvement and the prevention of complications.

1. *Definitive treatment:* This category includes chiefly progressive lesions of recent origin with little or no destruction of tissue, such as progressive primary tuberculosis and tuberculosis due to hematogenic and bronchiogenic dissemination.

2. *Preparation for surgical procedures, including temporary and permanent collapse and excisional surgery.* In some cases pneumothorax can be instituted sooner and with greater safety after a course of streptomycin. Not infrequently the drug is of great value in preparing patients as candidates for thoracoplasty. As prophylaxis, streptomycin should be used routinely in excisional procedures.

It must be emphasized again and again that streptomycin is *not* a substitute for sanatorium care and other proved procedures; rather it is a valuable adjunct to these other measures.

Extrapulmonary tuberculosis.—Streptomycin is the only treatment available in miliary tuberculosis and tuberculosis meningitis. In such cases early and intensive treatment is imperative. Streptomycin is the treatment of choice for tuberculous sinuses, tuberculosis of the oropharynx, larynx, and tracheobronchial tree, tuberculous enteritis and peritonitis, tuberculous otitis media, and tuberculous pericarditis. In renal tuberculosis, symptomatic improvement is usually prolonged

and bacterial conversion occurs in some cases. Tuberculosis of the bones and joints is often improved by streptomycin but chemotherapy is not a substitute for orthopedic surgery when this is indicated.

Streptomycin is valuable as preoperative and postoperative treatment of tuberculosis in surgery of the genito-urinary tract, surgery of bones and joints, pericardiolysis, incision and drainage of abscesses and fistulectomy.

Administration.—Streptomycin is administered by intramuscular or deep subcutaneous injection. The optimal regimen for the administration of streptomycin has not been determined. In most forms of tuberculosis results appear to be satisfactory when a dose of 0.5 to 1 gram a day are administered in one or two injections for 6 to 8 weeks. With this mode of therapy complications are very infrequent and in most cases their clinical importance may be discounted. In tuberculosis meningitis and miliary tuberculosis treatment should be vigorous; a dose as high as 2 grams per day for 4 months, or longer if necessary. In tuberculous meningitis results seemingly are better when intramuscular injection is supplemented by intrathecal injection of from 25 to 50 milligrams every 24 to 48 hours for 2 or 3 months, or as long as this method of administration is tolerated by the patient.

Since drug fastness is apparently closely related to duration of treatment, regardless of the daily dosage, limitation of the period to a few weeks may be effective in avoiding this phenomenon in many cases.

The physician handling a case of tuberculosis would do well to ask himself the following questions before administering streptomycin.

1. Why is streptomycin being used: for definitive therapy, as preparation for surgery, for prophylaxis, or for relief of distressing symptoms?

2. Is the type of lesion present of such a nature as to warrant the use of streptomycin in addition to other available therapy?

3. Can the purpose of chemotherapy be accomplished within the relatively short period of the drug's effectiveness? (Almost three-fourths of the patients show resistant organisms after 3 to 4 months of continuous daily streptomycin treatment.)

Other chemical and antibiotic substances.—There is no other substance known today which compares with streptomycin in its effectiveness against tuberculosis. The sulfones, promin and promizole, are generally ineffective alone. Experimental work is in process to determine whether or not there is synergistic action when any of these are added to streptomycin. Para-aminosalicylic acid is promising on the basis of laboratory experimentation but sufficient clinical work has not yet been done to permit evaluation of this drug. Subtilin

has not had sufficient clinical trial and there is not yet enough animal experimentation to indicate its usefulness. Of the many other antibiotic substances, none has shown in preliminary experimentation indication of real value against tuberculosis and none has had clinical trial.



ARTICLES OF SPECIAL MERIT PUBLISHED IN THE U. S. NAVAL MEDICAL BULLETIN DURING 1948

During the year 1948, 123 articles were published in the U. S. NAVAL MEDICAL BULLETIN. Following is a list of articles judged to be outstanding:

Title	Author
Alveolectomy, A Technique for.....	Lt. Comdr. F. T. Wigand (DC) USN.
Acute Empyema Thoracis, The Nonoperative Treatment of With Penicillin.	Comdr. Robert B. Brown (MC) USN; Lt. (jg) Robert K. Moxon (MC) USN.
Curare, The Use of in Anesthesia in a U. S. Naval Hospital.	Lieut. Charles W. Reynolds (MC) USN.
Hodgkins Disease.....	Lt. Comdr. Joseph R. Connelly (MC) USN; Lt. James T. Smith (MC) USN*; Lt. Joseph M. Straughan (MC) USN.*
Leprosy, Importance of in Orthopedic Surgery.	Comdr. John W. Metcalfe (MC) USN.
Liver Abscess.....	Capt. Thomas G. Hays (MC) USN; Comdr. Robert B. Brown (MC) USN; Comdr. Ellwood W. Godfrey (MC) USNR.†

*Resigned.

†To inactive status.

The Surgeon General has sent letters of commendation to the authors for their interest in the U. S. NAVAL MEDICAL BULLETIN and for their interest in their profession.



SIR HENRY WELLCOME MEDAL AND PRIZE IN 1948

The Association of Military Surgeons of the United States has awarded the Sir Henry Wellcome Medal and Prize to Lieutenant Commander Eugene P. Cronkite (MC) USN, and Lieutenant, junior grade, William H. Chapman (MSC) USN, for their article "A Critical Analysis of the Syndrome of Acute Total Body Radiation Illness."

The award consists of a silver medal, \$500, and a scroll inscribed with the title of the article.

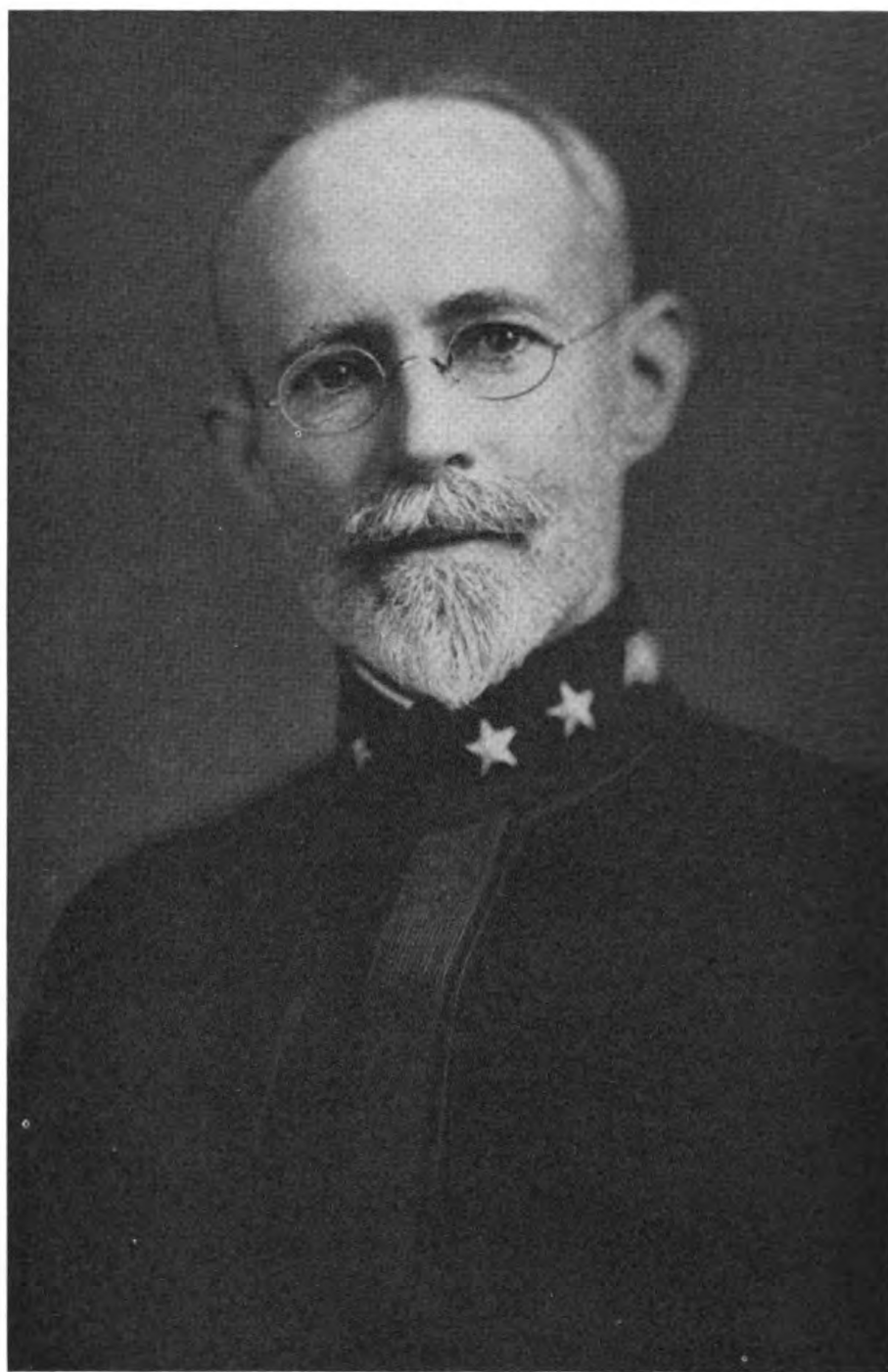
These officers are on duty at the Naval Medical Research Institute, National Naval Medical Center, Bethesda, Md.



OFFICERS OF THE MEDICAL DEPARTMENT

Whose Deaths Have Been Reported Since the Last Issue of the Bulletin

- BAKER, MAURY DAVIDSON, Lieutenant (MC) U. S. N. (Retired, Inactive). Died 10 October 1948 at U. S. Naval Hospital, National Naval Medical Center, Bethesda, Md.
- BLAIR, ALBERTA JEAN, Ensign (NC) U. S. N. R. (Inactive). Died 6 June 1948 at Lansing, Mich.
- BOLTON, ROBERT MESTON, Captain (MC) U. S. N. R. (Retired, Inactive). Died 16 September 1948 at Durham, N. H.
- BRUST, JOHN CALVIN MORRISON, SR., Commander (MC) U. S. N. R. (Inactive). Died 14 May 1948 at Syracuse, N. Y.
- CORBURN, FREDERICK HORACE, Lieutenant (DC) U. S. N. R. (Inactive). Died 3 April 1946 at Milwaukee, Wis.
- CROWLEY, EDWARD DANIEL, Commander (MC) U. S. N. R. (Inactive). Died 19 June 1946 at Veterans' Administration Hospital, Fort Custer, Mich.
- DAVIS, ROBERT GAYLORD, Rear Admiral (MC) U. S. N. (Retired, Inactive). Died 8 November 1948 at San Diego, Calif.
- FLAGG, LLOYD EUGENE, Lieutenant Commander (DC) U. S. N. R. (Inactive). Died 13 July 1948 at Buffalo, N. Y.
- JOHNSTON, SAMUEL BURKE 3d, Lieutenant (DC) U. S. N. R. (Inactive). Died 11 May 1948 at Budd Lake, N. J.
- KENNEDY, LOREN SILAS, Lieutenant Commander (DC) U. S. N. (Inactive). Died 8 October 1948 near Portales, N. M.
- LITTLE, RICHARD MITCHELL, Lieutenant Commander (MC) U. S. N. (Retired, Inactive). Died 3 September 1948 at Dallas, Tex.
- NESBITT, MARION MARGARET LEE, Lieutenant, junior grade (NC) U. S. N. R. (Retired, Inactive). Died 4 September 1948 at U. S. Naval Hospital, Oakland, Calif.
- O'CONNELL, ELMER CHARLES, Captain (DC) U. S. N. (Retired, Inactive). Died 3 November 1948 at U. S. Naval Hospital, San Diego, Calif.
- OMAN, CHARLES MALDEN, Rear Admiral (MC) U. S. N. (Retired, Inactive). Died 1 November 1948 at Beacon, N. Y.
- STITT, EDWARD RHODES, Rear Admiral (MC) U. S. N. (Retired). Died 13 November 1948 at U. S. Naval Hospital, National Naval Medical Center, Bethesda, Md.
- TITLEY, WILLIAM BAUMAN, Commander (MC) U. S. N. R. (Inactive). Died 13 December 1947 at Mercy Hospital, Sacramento, Calif.
- TURNBULL, JAMES ROBERT, Lieutenant, junior grade (DC) U. S. N. R. (Retired, Inactive). Died 4 July 1948 at Santa Monica, Calif.
- WICKES, GEORGE LEWIS, Commander (MC) U. S. N. (Retired, Inactive). Died 30 September 1948 at U. S. Naval Hospital, St. Albans, L. I., N. Y.



Rear Admiral Edward Rhodes Stitt (MC) USN, Ret.

EDWARD RHODES STITT
M. D., F. A. C. S., LL. D., Sc. D., Ph. M.

22 July 1867—13 November 1948

Rear Admiral Edward Rhodes Stitt (MC) USN (Retired) was born 22 July 1867. He acquired his elementary education in a private school and later entered the University of South Carolina, where he gained his A. B. degree in 1885. He then transferred to the University of Pennsylvania and studied under Sir William Osler, graduating with the degree of Doctor of Medicine in 1889.

Accepted in the Medical Corps of the Navy on graduation, he was commissioned an assistant surgeon in March 1889. His first few years in the Navy were spent in assignments ashore and afloat including duty in the U. S. S. *Baltimore*, one of the vessels of the famous "White Squadron," when that new crack cruiser sailed for Valparaiso during the Balmacedist revolution in Chili. He was also on duty in the U. S. S. (R. S.) *Franklin*, U. S. S. *Chicago*, U. S. S. *New York*, U. S. S. *Bache*, U. S. S. *Vermont* and the Naval Hospital in Norfolk, Va. In 1896 he reported to the Bureau of Medicine and Surgery, where he served during the Spanish-American War. In 1905, Rear Admiral Stitt served as medical officer of the Nicaraguan Canal Commission. The same year he was ordered to London, where he studied under Sir Patrick Manson at the London School of Tropical Medicine, graduating with distinction. He visited Manila, Canacao, and Olongapo, Philippine Islands; Guam, Marianas; Yokohama, Japan; and Honolulu, T. H., in connection with the study of tropical diseases. Subsequently as a teacher of tropical medicine in the newly established U. S. Naval Medical School in Washington, D. C., he did much to make this the leading school for postgraduate instruction in tropical medicine, and indeed the principal center for the study of tropical disease in the United States.

From 16 June 1909 until 11 June 1911 he was medical officer in command of the U. S. Naval Hospital, Canacao, Philippine Islands. Upon his appointment as Medical Inspector in June 1911 he returned to the United States for further duty in the Bureau of Medicine and Surgery, Navy Department, and the U. S. Naval Medical School, Washington, D. C., where he taught tropical

medicine in addition to directing the laboratory work. He assumed command of the Naval Medical School on 18 September 1916 and served in that capacity throughout World War I as Medical Director with the rank of rear admiral.

Concurrently with his military duties at the Medical School, he was professor of tropical medicine at both George Washington and Georgetown Universities in Washington, D. C., and delivered lectures on tropical medicine at the Jefferson Medical College in Philadelphia during the same period.

On 30 November 1920, Rear Admiral Stitt was appointed Surgeon General of the Navy and Chief of the Bureau of Medicine and Surgery (the sixteenth Surgeon General and the twentieth Chief of the Bureau). On 30 November 1924, he was again appointed Surgeon General of the Navy and Chief of the Bureau of Medicine and Surgery and served a second 4-year term in that dual capacity. Relieved of duty as Surgeon General and Chief of the Bureau of Medicine and Surgery, Rear Admiral Stitt was ordered in December 1928 to the West Coast for duty as Inspector of Medical Department activities in the eleventh naval district, San Diego, Calif. During his administration, much attention was devoted to hospital administration and aviation medicine was established as an official specialty.

Rear Admiral Stitt was transferred to the retired list of the Navy on 1 August 1931, upon reaching the statutory retirement age.

Among Rear Admiral Stitt's many honors, medals, and awards are included the Navy Cross for service during World War I, "for exceptionally meritorious service in a duty of great responsibility in connection with the U. S. Naval Medical School and in connection with general sanitation and military work at the school and throughout the service;" the honorary degree of LL. D. from the University of South Carolina in 1917, and the University of Michigan in 1921; D. Sc. from the Jefferson Medical College in 1920; Ph. M. from the Philadelphia College of Pharmacy and Science in 1929; Sc. D., University of Pennsylvania, 1924; and the Gorgas Medal, which was presented in 1942 by the Association of Military Surgeons of the United States to "a distinguished scholar and authority of international fame on tropical medicine."

Admiral Stitt was an internationally known authority on tropical medicine and clinical laboratory procedures and his books, "Diagnosis and Treatment of Tropical Diseases" and "Practical Bacteriology," were reprinted through several editions.

The Navy Medical Corps' premier physician, officer and gentleman, scientist, author and scholar; the personification of the thought embodied in the verse entitled "The Things That Are More Excellent":

"The grace of friendship—mind and heart
Linked with their fellow heart and mind;
The gains of science, gifts of art;
The sense of oneness with our kind;
The thirst to know and understand,
A large and liberal discontent;
These are the goods in life's right hand,
The things that are more excellent."

—*Sir William Watson.*



BOOK REVIEWS AND BOOK NOTICES



Publishers submitting books for review are requested to address them as follows:

The Editor,
UNITED STATES NAVAL MEDICAL BULLETIN,
Bureau of Medicine and Surgery, Navy Department,
Washington 25, D. C.

(For review)

NOTE: Books marked by symbol ①, ②, or ③ meet the library requirements for personnel training and are recommended by the Advisory Board, Bureau of Medicine and Surgery.

Symbol ① indicates that the book is recommended for naval hospitals; symbol ② for dispensaries and symbol ③ for dependents service or for medical departments of ships or stations.

MINOR SURGERY, by Frederick Christopher, B. S., M. D., F. A. C. S., *Associate Professor of Surgery, Northwestern University Medical School; Chief Surgeon, Evanston (Illinois) Hospital*. 6th edition. 1,058 pages; 937 illustrations on 595 figures. W. B. Saunders Co., Philadelphia, Pa., publishers, 1948. Price \$12.

Review previously published.

ENCYCLOPEDIA OF MEDICAL SOURCES, by Emerson Crosby Kelly, M. D., F. A. C. S., *Associate Professor of Surgery, Albany Medical College; Attending Surgeon, Albany Hospital; Editor, Medical Classics*. 476 pages. The Williams & Wilkins Co., Baltimore, Md., publishers, 1948. Price \$7.50.

Review previously published.

SOURCE BOOK OF ORTHOPAEDICS, by Edgar B. Bleck, M. A., M. D., F. A. C. S., *Diplomate Orthopedic Surgery, Associate Orthopedic Surgeon, The Mount Sinai Hospital, New York; Fellow American Academy Orthopedic Surgeons, Fellow in Orthopedic Surgery, New York Academy of Medicine, one time Regional Consultant Orthopedic Surgeon (Army), European Theatre of Operation*. 2d edition. 540 pages, illustrated. The Williams & Wilkins Co., Baltimore, Md., publishers, 1948. Price \$8.

Review previously published.

BOOK REVIEWS

THE ASEPTIC TREATMENT OF WOUNDS, by Carl W. Walter, A. B., M. D., *Assistant Professor of Surgery, Harvard University, Senior Associate in Surgery at the Peter Bent Brigham Hospital*. 372 pages, with illustrations by Mildred B. Coddling, A. B., M. A., *Surgical Artist, Peter Bent Brigham Hospital*. The Macmillan Company, New York, N. Y., publishers, 1948. Price \$9.

This well written and thoroughly illustrated monograph covers every phase of aseptic operating room procedure. It is a timely, laudable, and welcome attempt to overcome the carelessness nurtured by tradition, the inconsistencies and the discrepancies so often noted in the aseptic technic of the operating room; the further aim of the text is the scientific standardization of the technique of rendering aseptic the personnel and material in the operating room in accordance with the fixed and accepted principles, and thus eliminate the break in operating room technic so often introduced and brought about by changes in operating room personnel.

Chemical sterilization and physical methods of sterilization are discussed and many instructive facts are emphasized, such as: a 70 percent solution of alcohol by weight is 30 times as powerful a germicide at 60 percent solution, and 40 times as powerful as 80 percent solutions; solutions of less than 50 percent or more than 80 percent have no practical value as germicides; 70 percent of the knife blades which are used during routine surgical operations become contaminated with spore-forming bacteria; the strongest applicable germicide requires 3 hours to destroy spores, and at least 20 minutes to destroy vegetative bacteria; in the operation of steam sterilizers the temperature required to destroy the least accessible organism is of paramount importance rather than the heat of the sterilizer.

The mechanism for pollution of water supply and the source of contamination in water sterilizers are clearly described and illustrated. The design, mechanics, and maintenance and the method of the equipment for pressure steam sterilization are thoroughly covered and the factors responsible for improper function and the means of correction are graphically described.

Sterilization of dressings and the care of sterilization of instruments, positioning the patients, skin disinfection, draping, terminal sterilization, and every other phase of operating room procedure is thoroughly described and discussed.

Central supply room procedures, preparation of parenteral fluid, the material requirement for blood and plasma facilities and testing of collection, and preparation of blood and plasma is fully covered.

This book is a valuable addition to the hospital library, the armamentarium of the operating room. It should be read by the surgeon, intern, student, and surgical nurse.—J. L. S.

A COURSE IN PRACTICAL THERAPEUTICS, by Martin Emil Rehfuss, M. D., F. A. C. P., *Professor of Clinical Medicine and Sutherland M. Prevost Lecturer in Therapeutics, The Jefferson Medical College, Philadelphia*; Attending Physician, *The Jefferson Medical College Hospital, Philadelphia*; F. Kenneth Albrecht, M. D., *Formerly Clinical Director U. S. Marine Hospital, Baltimore, Md., and Co-director Division of Tuberculosis Control, Kansas State Department of Health*; and Alison Howe Price, A. B., M. D., *Asst. Professor of Medicine, The Jefferson Medical College, Philadelphia*; *Asst. Physician to the Jefferson Medical College Hospital, Philadelphia*, and 10 other contributors. 824 pages, illustrated. The Williams and Wilkins Company, Baltimore, Md., publishers, 1948. Price \$15.

A complete, factual, and practical volume devoted to the treatment of disease. Symptomatic and specific therapy is presented for practically every condition encountered by the physician. Thousands of prescriptions from many sources, such as the United States Pharmacopoeia and the Council of Pharmacy of the American Medical Association. Numerous proprietary drugs of therapeutic merit are described.

Practical and concise information is given regarding radiation and radioactive isotopes, physical therapy, psychotherapy, psychosomatic medicine, occupational therapy and rehabilitation, pre- and post-operative cure, pediatrics, otolaryngology, ophthalmology, dermatology, and vitamin deficiency states; gastroin-

testinal disease, blood and blood-forming organs, endocrine disorders, infectious and venereal diseases, cardiorenal, vascular, pulmonary, and respiratory diseases, and many other conditions.

This book probably contains the most complete coverage of treatment to be found in any single volume. It is enthusiastically recommended for the physician, resident, intern, and student.—*J. L. S.*

PRINCIPLES GOVERNING EYE OPERATING ROOM PROCEDURES, by Emma I. Clevenger, R. N.,
① *Supervisor, Eye Operating Room, New York Eye and Ear Infirmary, New York City.*
② 215 pages; illustrated. The C. V. Mosby Company, St. Louis, Mo., publishers, 1948.
Price \$5.50.

This book enumerates all surgical instruments and equipment required for ophthalmologic surgery and includes all the newer types required for the more recent techniques. There is brief but ample description of the purposes, care, and handling of these instruments.

A short chapter enumerates all drugs and solutions used in the eye operating room, and indicates their purpose and dose.

Every phase of the selection and the arrangement of instruments and operating room equipment required, and the routine duties of the eye operating room nurse, for any given operative procedure, is clearly and succinctly covered.

The book is amply illustrated, and the pictures of the instruments, trays, and operating room arrangement are clearly portrayed.

This is an excellent reference book for the eye operating room nurse and supervisor, and should be valuable to the ophthalmologic surgeon.—*J. L. S.*

GLOMERULAR NEPHRITIS, Diagnosis and Treatment, by Thomas Addis, M. D., F. R. C. P.,
(Edin.). 338 pages. The Macmillan Company, New York, N. Y., publishers, 1948.
Price \$8.

This is a masterful presentation by an outstanding clinician, scientist, and scholar.

The internist and the pathologist will gain much from the chapters dealing with clinical laboratory examinations and dietetics as well as from the very practical approach to direct methods in laboratory procedures, diagnosis, and treatment.

As a result of his ingenious and painstaking experiments with rats with partially ablated kidneys, Dr. Addis developed his thesis that the major work of the kidneys is the elimination of urea and that the damaged kidney would be materially benefited by a low protein diet which would lessen the endogenous formation of urea and thus provide a rest for the kidney. Also a high fluid intake is required for the same reason.

The pathogenesis and course of glomerular nephritis following streptococcal infections are thoroughly discussed. The chapters on treatment correlate all the experimental studies with their practical application in the management of glomerulonephritis.—*Julian Love, Captain (MC) USN.*

DETAILED ATLAS OF THE HEAD AND NECK, by Raymond C. Truex, M. S., Ph. D., Associate
① *Professor of Anatomy, College of Physicians and Surgeons, Columbia University, and*
Carl E. Kellner, Artist, Department of Anatomy, College of Physicians and Surgeons,
Columbia University. 162 pages, illustrated. Oxford University Press Inc., publishers, 1948. Price \$15.

An atlas of the head and neck is indeed a monumental achievement. This reviewer has seen no anatomical plates that surpass these in excellence. Dr. Truex and Mr. Kellner are to be congratulated on this volume and I surmise that they already have been urged to extend their field to other regions of the body.

The presentation is in a most systematic manner, and the sequence of the anatomical dissections is such as to depict the fascia, muscles, blood vessels,

nerves and bones at various levels and the anatomical and surgical relationship of all structures transversed are readily visualized; for example one sees the posterior triangle of the neck successively displayed through a series of deeper and deeper dissections, finally reaching the axilla. This is the gravitational course for dissecting abscesses.

The apparent goal of correlating the surgical anatomy with its clinical application is realized in the beautifully portrayed topographical relationship.

This is a valuable volume for the specialist, resident, intern, and practitioner, and is a requisite for an understanding of the intrinsic anatomy of the head and neck.—*C. A. Swanson, Rear Admiral (MC) USN.*

DISEASES OF CHILDREN'S EYES, by James Hamilton Doggart, M. A., M. D. (Cantab.), F. R. C. S., Eng., *Ophthalmic Surgeon, Hospital for Sick Children, Great Ormond Street, London; Surgeon and late Research Scholar, Royal London Ophthalmic Hospital, Ophthalmic Surgeon, St. George's Hospital; Lecturer in Ophthalmology at St. George's Hospital Medical School; Late Senior Open Foundation Scholar, Kings College, Cambridge; Late Wing-Commander, Royal Air Force Medical Service, Volunteer Reserve.* 288 pages, 210 illustrations, including 32 colored plates. The C. V. Mosby Company, St. Louis, Mo., publisher, 1947. Price \$10.

This book is an excellent practical discussion of ophthalmology in children. It is readable and brief.

After briefly covering the anatomy and development of the eye, the author takes up each subject in ophthalmology beginning with developmental anomalies and ending with diseases of the optic nerve. One chapter is devoted to ocular manifestations of disease elsewhere, another to ocular welfare. A special chapter on examination and another on treatment is included.

This author does not go into much detail, which would be impossible in a book of this size. Each subject is written more in the vein of a practical discussion rather than that of a textbook.

This book is considered especially worthwhile to the student in ophthalmology, the pediatrician, or the general practitioner.—*Thomas E. Atkinson, Jr., Lieutenant (MC) USN.*

CLINICAL LABORATORY METHODS AND DIAGNOSIS, a textbook on laboratory procedures with their interpretation by R. B. H. Gradwohl, M. D., D. Sc., F. R. S. T. M. & H. (London), 4th Edition in three volumes. 4,398 pages, 170 pages of index, 1,111 illustrations in black and white and 58 plates in color. The C. V. Mosby Company, St. Louis, Mo., publishers, 1948. Price \$40.

Dr. Gradwohl's excellent one volume textbook of clinical laboratory methods has now been expanded until it has become almost an encyclopedia of the subject. The overworked word of the movie advertisers, colossal, is about the only word that describes it. Not only can no laboratory be without it but its value to every physician for diagnostic and prognostic information is evident. Of great interest are the sections on toxicology and crime detection.

The numerous illustrations and colored plates are very fine. It would have been desirable to have had the continuous pagination carried through to the end of the work.

The third volume is entirely devoted to parasitology and tropical medicine. Dr. Pedro Kouri, Professor of Tropical Medicine at the Medical School of Havana University collaborated with Dr. Gradwohl in this part of the book.—*L. H. Roddis, Captain (MC) USN.*

FRACTURES, DISLOCATIONS AND SPRAINS, by John Albert Key, B. S., M. D., and H. Earle Conwell, M. D., F. A. C. S. 4th edition, 1,322 pages; fully illustrated with photographs and diagrams. C. V. Mosby Company, St. Louis, Mo., publisher, 1946. Price \$12.50.

This fourth edition is a comprehensive and practical volume containing many excellent illustrations and diagrams that follow the text closely. Because

of their importance, a chapter on the Workmen's Compensation Laws has been included, as well as a chapter on medico-legal aspects in fracture cases.

Influenced by the experience gained in the recent war, many new methods in treatment of compound fractures and injuries to the spine and hip have been described.

This is an authoritative, well-written manual that covers the field of fractures, sprains and dislocations in a very thorough manner. It is recommended for the general practitioner and the resident as well as the specialist.—*W. F. James, Captain (MC) USN.*

DISEASES OF THE EAR, NOSE AND THROAT, by William Wallace Morrison, M. D., *Professor of Otolaryngology and Attending Otolaryngologist, New York Polyclinic Medical School and Hospital; Senior Assistant Surgeon, in Otolaryngology, New York Eye and Ear Infirmary; Associate Clinical Professor of Otolaryngology, New York University College of Medicine; Captain, Medical Corps (U. S. N. R.).* 772 pages, illustrated. Appleton-Century-Crofts, Inc., New York, N. Y., publishers, 1948. Price \$8.50.

This clearly and concisely written book is well known to students and junior residents for its wealth of fact and scarcity of theory. There is an amazing amount of material crowded into a relatively small volume, giving it encyclopedic value. Many pertinent discussions are given on such important matters as the treatment of toxic reactions to local anesthetics, proper indications for specific modern chemotherapy, the causes of headache, and several other interesting topics usually not found in a specialty book of this type.

This book should be in the library of every general practitioner and every otolaryngologist.—*A. J. Delaney, Captain (MC) USN.*

DISEASES OF THE EYE, by Sir John Herbert Parsons, C. B. E., D. Sc., F. R. C. S., F. R. S., *Consulting Ophthalmic Surgeon, University College Hospital; Consulting Surgeon, Royal London (Moorfields) Ophthalmic Hospital; Late Ophthalmic Surgeon, Hospital for Sick Children, Great Ormond Street and Sir Stewart Duke-Elder, K. C. V. O., M. A., D. Sc., Ph. D., M. D., F. R. C. S., Hon. D. Sc. (North Western), Surgeon Oculist to the King; Consulting Ophthalmic Surgeon to the Army and Royal Air Force; Director of Research, The Ophthalmic Institute, University of London; Consulting Ophthalmic Surgeon, Moorfields, Westminster and Central Eye Hospital, Ophthalmic Surgeon, St. George's Hospital.* 732 pages with 21 plates and 368 text figures. 11th edition. The Macmillan Company, New York, N. Y., publishers, 1948. Price \$7.

The eleventh edition of this well-known and excellent reference textbook should have especial appeal to residents in ophthalmology and to general practitioners who are required to know the essentials of ophthalmological implications of brucellosis and toxoplasmosis is included. It is now known that brucellosis is one of the causes of uveitis, keratitis, choroiditis, and optic neuritis and that toxoplasmosis is a protozoan infection which is one of the causes of chorioretinitis and uveitis.

The greatest change in this edition is the inclusion of some of the newest chemotherapeutic agents such as the sulfonamide group of drugs and penicillin.—*C. A. Swanson, Rear Admiral (MC) USN.*

HEMOSTATIC AGENTS With Particular Reference to Thrombin, Fibrinogen and Absorbable Cellulose, by Walter H. Seegers, M. S., Ph. D., *Professor of Physiology, Wayne University College of Medicine, Detroit; Michigan,* and Elwood A. Sharp, M. D., Sc. D., *Director, Department of Clinical Investigation, Parke, Davis and Company, Lecturer, Department of Medicine, Wayne University College of Medicine, Detroit, Michigan.* 131 pages, illustrated. Charles C Thomas, Springfield, Ill., publishers, 1948. Price \$4.50.

This small, readable, well-illustrated book by leaders in the field of blood coagulation fills a definite need in the armamentarium of the surgeon, the internist, the hematologist, and the investigator. The references are complete.

The mechanism of blood coagulation and the hemostatic action of plasma fraction is concisely presented and discussed. The clinical application of the hemostatic agents and controversial aspects are discussed in an open-minded manner.

The correlation between the basic research and the clinical application is so complete and well coordinated that clinicians and researchers who read this book will better understand each other's problems.—*E. P. Cronkite, Lieutenant Commander (MC) USN.*

UNIPOLAR LEAD ELECTROCARDIOGRAPHY, Including Standard Leads, Unipolar Extremity Leads and Multiple Unipolar Precordial Leads, by Emanuel Goldberger, B. S., M. D., Adjunct Physician, Montefiore Hospital, New York; Cardiographer and Associate Physician, Lincoln Hospital, New York; Diplomate of the American Board of Internal Medicine; Clinical Lecturer in Medicine, Columbia University, Faculty of Medicine. 182 pages; 88 illustrations. Lea & Febiger, Philadelphia, Pa., publishers, 1947. Price \$4.

The clinical use of unipolar lead electrocardiography has produced the need for more textual source material on that subject than has been supplied in books dealing with the general subject of electrocardiography.

An orderly description of normal and abnormal cardiac conditions as reflected in electrocardiograms is given. Illustrative sets of electrocardiograms are reproduced, for each specific condition considered, which show the three standard leads, the three augmented unipolar extremity leads, and the six unipolar precordial leads. All of these leads are considered in terms of underlying physiological principles and basic unipolar lead patterns. Cardiac abnormalities discussed in some detail include: auricular and ventricular hypertrophy, congenital heart disease, bundle branch block, myocardial injury, pericarditis, and digitalis effect.

The advantage of unipolar extremity and precordial leads is pointed out in many clinical conditions where unipolar leads show abnormalities while standard leads appear normal.

This book should provide considerable aid in utilizing unipolar lead electrocardiography in clinical practice.—*J. A. Grindell, Commander (MC) USN.*

CONCISE ANATOMY, by Linden F. Edwards, Ph. D., Professor of Anatomy, the Ohio State University, Columbus, Ohio. 548 pages; 324 illustrations. The Blakiston Company, Philadelphia, Pa., publishers, 1947. Price \$5.50.

This book supplants and is an improvement over the former text "Anatomy for Physical Education," and, like it, is written primarily for the student in the auxiliary fields of medicine, such as: physical therapy, occupational therapy, physical education, and nursing. A short chapter covers microscopic and developmental anatomy following which the bones, muscles, articulations, blood vessels and nerves are considered. The respiratory, digestive, urogenital, and endocrine systems are also covered briefly but clearly, in the final chapter. The arrangement of the subject matter is of such character that any sequence of topics may be followed.

This is an excellent teaching and reference textbook for Hospital Corps personnel.—*J.L.S.*

ON HOSPITALS, by S. S. Goldwater, M. D., formerly Superintendent and Director, The Mount Sinai Hospital, New York; Commissioner of Health of the City of New York; Consultant in Hospital Organization and Planning; Commissioner of Hospitals of the City of New York. 395 pages; illustrated. The Macmillan Company, New York, N. Y., publishers, 1947. Price \$9.

This book is a compilation of some of the previously published and unpublished addresses and papers left by Dr. Goldwater. His outstanding and expert ability in the planning, organization, and direction of hospitals is well known. The

relationship of the physician to the hospital and of hospital organization to the welfare of the patient is clearly presented. The details in the planning and construction of a hospital are thoroughly and fully presented. A chapter is devoted to the architecture and structure of a number of representative hospitals.

This book should serve as a guide for those charged with the building, maintenance, or administration of a hospital.

A TEXTBOOK OF MEDICINE, edited by Russell L. Cecil, A. B., M. D., Sc. D., *Professor of Clinical Medicine, Cornell University Medical College; Consulting Physician, New York and Veterans' Hospitals; Visiting Physician, Bellevue Hospital, New York City*, with the assistance of Walsh McDermott, M. D., *Associate Professor of Medicine, Cornell University Medical College; Associate Editor of Diseases of the Nervous System*, and Harold G. Wolff, M. D., *Associate Professor of Neurology, Cornell University Medical College*. 7th edition. 1,730 pages; numerous illustrations. W. B. Saunders Co., Philadelphia, Pa., publishers, 1947. Price \$10.

This well-known and universally acclaimed textbook of medicine contains many new articles on subjects, such as hypervitaminosis, headache, psychosomatic medicine, hemifacial spasm, and other subjects not covered in previous editions.

The double column format of the sixth edition has been retained. The illustrations and bibliography are complete and excellent.

One hundred and sixty-two contributors have furnished material for an encyclopedic and outstanding textbook of medicine for the student and the general practitioner.

INTERNAL MEDICINE IN GENERAL PRACTICE, by Robert Pratt McCombs, B. S., M. D., F. A. C. P., *Assistant Professor of Medicine and Director of Postgraduate Teaching, Tufts College Medical School; Senior Attending Physician, The Joseph H. Pratt Diagnostic Hospital; Diplomate of the American Board of Internal Medicine*. 2d edition. 741 pages; numerous illustrations. W. B. Saunders Co., Philadelphia, Pa., publisher, 1947. Price \$8.

This book covers the fundamentals of diagnosis and the prominent features of the important or common problems of internal medicine in an excellent manner. Without attempting to be an encyclopedic text or system of medicine, it quite adequately cares for ninety percent or more of the problems in this field. Topics of a controversial nature are presented so that the reader appreciates all points of view. There are many good discussions or tables of differential diagnosis. Laboratory studies are brought in according to their relative importance in the different diseases and the emphasis is on the important and simple tests rather than on a comparison of a battery of tests. In therapeutics, the author discusses such topics as sulfonamides, penicillin, streptomycin, antihistaminics, endocrines, anticoagulants, lumbodorsal sympathectomy, the rice diet, folic acid, gamma globulins, chloroquine in malaria, para-amino-benzoic acid in rickettsial diseases, cytochrome C, and thio-uracil.

This book should be in the medical library of every ship and dispensary, as well as in the hospital libraries, and should be of great assistance to all medical officers irrespective of their specialties.—*R. C. Parker, Commander (MC) USN.*

TAKING THE CURE, *The Patient's Approach to Tuberculosis*, by Robert G. Lovell, M. D., *University Hospital, University of Michigan, Ann Arbor, Michigan*. 93 pages; illustrated by Donald Gooch. The Macmillan Company, New York, N. Y., publishers. 1948. Price \$2.

This is a book that the physician would want to recommend to every new tuberculosis patient. It gives the patient a better understanding of his disease in the language of the layman. Many problems which may seem minor and are often overlooked by the busy physician and are so very necessary to the psychological adjustment of a new tuberculosis patient are handled admirably. The appendix contains many suggestions for reading, music, games, and crafts.

Dr. Lovell, himself a victim of tuberculosis, combined a keen insight and understanding of the patient's problems with an excellent knowledge of tuberculosis to produce a book which is a significant contribution to the treatment of the disease.

A copy of this book should be provided for each new patient admitted to tuberculosis treatment centers. If feasible, the book should be donated to the patient. This book will be of inestimable value in accomplishing the extremely important task of bringing about psychological adjustment in the new tuberculosis patient.—*R. O. Canada, Commander (MC) USN.*

REHABILITATION OF THE PHYSICALLY HANDICAPPED, by Henry H. Kessler, M. D., Ph. D. 274 pages, Columbia University Press, New York, N. Y., publishers, 1947. Price \$3.50.

Doctor Kessler points out that rehabilitation of the physically handicapped individual, including the mentally ill, the blind, and the deaf, has come to be regarded as a creative process in which the remaining physical and mental capacities are developed to their highest efficiency, in order to restore the capacity to engage in the routine pursuits of life. He indicates that the program should be keyed to avoid the by-products of prolonged hospitalization, such as physical and mental deterioration which come about as the result of enforced bed rest and general inactivity.

The principles which govern physical and social rehabilitation of handicapped persons are clearly presented. Of great interest is Dr. Kessler's recommendation of a health record for each civilian similar to the Navy health record.

A complete bibliography is included.—*G. W. Tayloe, Captain (MC) USN.*

THE TREATMENT OF ARTHRITIS AND RHEUMATISM IN GENERAL PRACTICE, by Bernard Aschner, M. D., *Chief of the Outpatient Department for Arthritis at the Stuyvesant Polyclinic, N. Y.* The Froben Press, New York, N. Y., publishers, 1946. Price \$5.

Bernard Aschner has written a most interesting book on arthritis and rheumatism in general practice. The reviewer agrees with him that medicine is truly an art and that excessive use of laboratory procedures in an attempt to evaluate the condition frequently lead us astray, particularly in the treatment of the chronic diseases. Emphasis is placed on the necessity for instituting early treatment for speedy relief of symptoms. Particular emphasis is made on the fact that each case is a problem to itself and cannot be handled according to rote. An interesting introduction and epilogue round out an excellent book for the general practitioner.—*George W. Calver, M. D.*

DIAGNOSTIC ROENTGENOLOGY, edited by Ross Golden, M. D., *Professor of Radiology, the College of Physicians and Surgeons, Columbia University; Director of the Department of Radiologic Service, The Presbyterian Hospital, New York.* Volumes 1 and 2 contain 1,168 pages; illustrated. Thomas Nelson & Sons, New York, N. Y., publishers, 1947. Price \$40.

The present revision of this well-known work is a welcome contribution to roentgenological literature.

These two loose-leaf type volumes are encyclopedic in scope, thorough in presentation, amply illustrated, and authoritatively prepared by outstanding workers in the various fields. It is an excellent reference in interpretative work.

The anomalies of the skull and the urinary tract; a chapter on differential diagnosis of abnormal lung shadows; many photographs of gross morbid changes accompanying radiographic illustrations in the section on the digestive tract; the skeletal development chart of Dr. Paul Hodges; full consideration of uterotubography and obstetrical roentgenology; a chapter on dental roentgenology; special and ample consideration of roentgenological diagnosis in infants and

children; and finally, chapters on sectional radiography and angiography, are all complete.

Despite the general excellence of this work there are several changes the reviewer would suggest for any future issues, such as a better system of numbering pages; replacement of some of the illustrations; a consideration of photo-fluorography in the section on pulmonary diseases; and finally, in a few instances, more extended consideration.—*C. F. Behrens, Captain (MC) USN.*

PREOPERATIVE AND POSTOPERATIVE CARE, by William J. Tourish, M. D., F. A. C. S., *Demonstrator of Surgery and Chief Clinical Assistant in Surgery, Jefferson Medical College Hospital*; Frederick B. Wagner, Jr., M. D., *Instructor in Surgery and Assistant in Surgery; former resident and Ross V. Patterson Fellow in Surgery, Jefferson Medical College and Hospital*; and 6 contributors. Foreword by Thomas A. Shallow, M. D. 338 pages; 87 illustrations. F. A. Davis Company, Philadelphia, Pa., publishers, 1947. Price \$6.

The simple style of this excellent book makes it easy to read and easy to understand. The basic principles and procedures of good pre- and post-operative care are outlined numerically and follow in the order of their importance.

The authors have outlined first the general principles of preoperative and postoperative complications into immediate, early, and late, and have applied them specifically to each of the common surgical operations.

The authors state that the procedures they recommend are based on those followed in various large clinics as well as in the Surgical Department of the Jefferson Medical College Hospital.

This book is an excellent teaching text and answers clearly the questions of "when and what to do." It is recommended to the general practitioner, the resident, intern, and senior medical student.—*H. W. Rose, Captain (MC) U. S. N.*



BOOK NOTICES

Receipt of the following books is acknowledged. As far as practicable, these will be reviewed at a later date.

RECENT ADVANCES IN ENDOCRINOLOGY, by A. T. Cameron, C. M. G., M. A., D. Sc. (Edn.), F. R. I. C., F. R. S. C., *Professor of Biochemistry, Faculty of Medicine, University of Manitoba; Biochemist, Winnipeg General Hospital*. 6th edition. 443 pages. Illustrated. The Blakiston Company, Philadelphia, Pa., publishers, 1947. Price \$6.

DISEASES OF THE GALLBLADDER AND ALLIED STRUCTURES, Diagnosis and Treatment, by Moses Behrend, M. D., F. A. C. S., F. I. C. S., *Consulting Surgeon, Jewish Hospital and Mt. Sinai Hospital; formerly Thoracic Surgeon, Philadelphia General Hospital, and Department of Tuberculosis and the State Sanatorium, Hamburg, Pa.; Associate in Surgery, Jefferson Medical College* with 11 collaborators. Foreword by Thomas A. Shallow, M. D., *Samuel D. Gross Professor of Surgery, Jefferson Medical College*. 290 pages; 110 illustrations, 6 in color. F. A. Davis Company, Philadelphia, Pa., publishers, 1947. Price \$7.

A MANUAL OF OTOTOLOGY, RHINOLOGY AND LARYNGOLOGY, by Howard Charles Ballenger, M. D., F. A. C. S., *Associate Professor and Acting Chairman of the Department of Otolaryngology, Northwestern University School of Medicine, Chicago, Illinois, Surgeon, Department of Otolaryngology, Evanston Hospital, Evanston, Illinois*. 3d edition, enlarged and thoroughly revised; 352 pages; 135 illustrations; 3 color plates. Lea & Febiger, Philadelphia, Pa., publisher, 1947. Price \$4.50.

TECHNIQUES AND PROCEDURES OF ANESTHESIA, by John Adrlani, M. D., *Director, Department of Anesthesia, Charity Hospital of Louisiana, Clinical Assistant Professor of Surgery (Anesthesiology) Louisiana State University*. 404 pages; illustrated. Charles C Thomas, Springfield, Ill., publishers, 1947. Price \$6.

PHYSIOLOGY OF MAN IN THE DESERT, by E. F. Adolph and associates, *Department of Physiology, University of Rochester*. 357 pages, illustrated. Interscience Publishers, Inc., New York, N. Y., publishers, 1947. Price \$6.50.

GIFFORD'S TEXTBOOK OF OPHTHALMOLOGY, by Francis H. Adler, M. D., *Professor of Ophthalmology, University of Pennsylvania Medical School*. 4th Edition. 512 pages; illustrated. W. B. Saunders Company, Philadelphia, Pa., publishers, 1947. Price \$6.

INTRODUCTION TO SURGERY, by Virginia Kennland Frantz, M. D., *Assistant Professor of Surgery, College of Physicians and Surgeons, Columbia University; Associate Attending Surgical Pathologist, Presbyterian Hospital, New York; and Harold Dortie Harvey, M. D., Assistant Professor of Clinical Surgery, College of Physicians and Surgeons, Columbia University; Assistant Attending Surgeon, Presbyterian Hospital, New York*. 216 pages. Oxford University Press, New York, N. Y., publishers, 1946. Price \$2.50.

MEDICAL DISORDERS OF THE LOCOMOTOR SYSTEM INCLUDING THE RHEUMATIC DISEASES, by Ernest Fletcher, M. A., M. D., (Cantab.), M. R. C. P., *Physician to the Arthritis Clinic and Lecturer on the Rheumatic Diseases, Royal Free Hospital; Physician, Queen Mary's Hospital for the East End and the British Red Cross Clinic for Rheumatism; Consulting Physician to the British Legion; Heberden Medallist and Lecturer in Rheumatism; Member of the Research and Scientific Advisory Committee, Empire Rheumatism Council; late Physician-in-Charge of a Medical Division, Emergency Medical Service, Ministry of Health; Consulting Physician to the Kent County Council*. 625 pages; illustrated. The Williams and Wilkins Company, Baltimore, Md., publishers, 1947. Price \$11.

A HANDBOOK FOR THE DIAGNOSIS OF CANCER OF THE UTERUS BY THE USE OF VAGINAL SMEARS, by Olive Gates, M. D., *Pathologist, Massachusetts State Tumor Diagnosis Service; Assistant Pathologist, Pondville Hospital, (Massachusetts Department of Public Health); and Shields Warren, M. D., Assistant Professor of Pathology, Harvard Medical School; Pathologist, New England Deaconess and New England Baptist Hospitals; Reserve Consultant in Pathology to the Bureau of Medicine and Surgery, United States Navy, Captain (M. C.) U. S. N. R.* Foreword by George N. Papanicolaou, M. D., Ph. D., *Associate Professor, Department of Anatomy; Research Associate, Department of Obstetrics and Gynecology, Cornell University Medical College and New York Hospital*. 182 pages, illustrated. Harvard University Press, Cambridge, Mass., publishers, 1947. Price \$4.

IF YOU NEED AN OPERATION, by Richard A. Leonardo, M. D., Ch. M., F. I. C. S. 198 pages. Froben Press, New York, N. Y., publishers, 1947. Price \$3.

CLINICAL METHODS OF NEURO-OPHTHALMOLOGIC EXAMINATION, by Alfred Kestenbaum, M. D., *Assistant Clinical Professor of Ophthalmology, New York University; Lecturer in Ophthalmology, Mt. Sinai Hospital; Associate Ophthalmologist, City Hospital; Consultant Ophthalmologist, Psychiatric Department, Bellevue Hospital, and Neurologic Department, Goldwater Memorial Hospital*. 384 pages. Grune and Stratton, New York, N. Y., publishers, 1946. Price \$6.75.

ESSENTIALS OF PHARMACOLOGY, by Frances K. Oldham, M. Sc., Ph. D., *Research Associate in Pharmacology, The University of Chicago*, F. E. Kelsey, Ph. D., *Associate Professor of Pharmacology, The University of Chicago*, and E. M. K. Gelling, Ph. D., M. D., *Frank P. Hixon, Distinguished Service Professor and Chairman of the Department of Pharmacology, The University of Chicago*. 440 pages. J. B. Lippincott Company, Philadelphia, Pa., publishers, 1947. Price \$5.

THE ENGRAMMES OF PSYCHIATRY, by J. M. Nielsen, B. S., M. D., F. A. C. P., *Associate Clinical Professor of Neurology and Psychiatry, School of Medicine, University of Southern California, Senior Attending Physician (Neurology), Los Angeles General Hospital, Fellow of the American Psychiatric Association*, and George N. Thompson, A. B., M. D., *formerly Chief of Psychiatric Service, Los Angeles County General Hospital, Assistant Clinical Professor of Neurology and Psychiatry, School of Medicine, University of Southern California, Psychiatric Consultant, Department of Corrections, State of California, Fellow of the Ameri-*

can Psychiatric Association. 509 pages; illustrated. Charles C Thomas, Springfield, Ill., publishers, 1947. Price \$6.75.

PRINCIPLES AND PRACTICE OF THE ROBSCHACH PERSONALITY TEST, by Walter E. R. Mons. M. R. C. S., L. R. C. P., Lt.-Col. R. A. M. C., *Adviser in Psychiatry, S. E. A. C., Late consultant Psychologist, Cornwall County Education Committee, Hon. Psychotherapist, Cornwall County Mental Hospital*. 164 pages. J. B. Lippincott Company, Philadelphia, Pa., publishers, 1948. Price \$4.

OSTEOTOMY OF THE LONG BONES, by Henry Milch, M. D., *Consulting Orthopedist, Maimonides Hospital, Attending Orthopedic Surgeon, Hospital for Joint Diseases and Riverside Hospital, New York, Fellow of the American Academy of Orthopedic Surgeons of the American College of Surgeons of the New York Academy of Medicine*. 294 pages; illustrated. Charles C Thomas, Springfield, Ill., publishers, 1947. Price \$6.75.

RHINOPLASTY AND RESTORATION OF FACIAL CONTOUR, with Special Reference to Trauma, by Jacques W. Mallinac, M. D., *Clinical Professor, Plastic Reparative Surgery; and Associate Attending Plastic Surgeon, New York Polyclinic Medical School and Hospital, New York; Attending Plastic Surgeon, Sydenham Hospital, New York; Licentiate American Board of Plastic Surgery; Licentiate American Board of Otorhinolaryngology (for Plastic Surgery)*. 327 pages; 214 illustrations. F. A. Davis Company, Philadelphia, Pa., publishers, 1947. Price \$7.50.

DIABETIC CARE IN PICTURES, Simplified Statements with Illustrations Prepared for the Use of the Patient, by Helen Rosenthal, B. S., *Associate Dietitian in the Food Clinic, The Boston Dispensary; Assistant in Medicine, Tufts College Medical School*, Frances Stern, M. A. (Honorary) *Chief of the Food Clinic, The Boston Dispensary; Instructor of Medicine, Tufts College Medical and Dental Schools; Special Instructor in Dietetics in Social Service, Simmons College, The School of Social Work; Associate in Nutrition, Simmons College, School of Home Economics*, and Joseph Rosenthal, M. D., *Chief of Diabetic Clinic, Assistant Medical Director, Medical Supervisor of the Domiciliary Medical Service, The Boston Dispensary; Assistant Professor of Medicine, Tufts College Medical School; Associate Physician, Joseph H. Pratt Diagnostic Hospital*. 150 pages; 137 illustrations; 4 in color, prepared under the direction of the authors. J. B. Lippincott Company, Philadelphia, Pa., publishers, 1946. Price \$2.

THE HEAD, NECK, AND TRUNK, Muscles and Motor Points, by Daniel P. Quiring, Ph. D., *Head of the Anatomy Division, Cleveland Clinic Foundation and Associate Professor of Biology, Western Reserve University*. 115 pages; illustrated. Lea & Febiger, Philadelphia, Pa., publishers, 1947. Price \$2.75.

MODERN METHODS OF AMPUTATION, by Edmundo Vasconcelos, *Professor, University of Sao Paulo*, with an Introductory Survey of The Development of Amputation by Major Gen. Norman T. Kirk, M. C., *Surgeon General, U. S. Army*. 253 pages; illustrated. The Philosophical Library of New York, Department of War Medicine, New York, N. Y., publishers, 1945. Price \$10.

PULMONARY TUBERCULOSIS AND ITS TREATMENT, by Hans Jacob Ustvedt, M. D., *Oslo, Chief Physician to the Ullersaal Municipal Hospital, IX Department (internal medicine) Oslo; Lecturer on internal medicine and tuberculosis*. Translated by A. L. Jacobs, M. R. C. P. 252 pages; illustrated with 45 plates in black and white, and color. Staples Press Limited, London, publishers, 1947. Price 25 shillings.

DIABETES, The Diabetic in the Community, by Mary E. Tangney, R. N., *Diabetic Supervisor, Hartford Hospital, Connecticut*. 259 pages. W. B. Saunders Company, Philadelphia, Pa., publishers, 1947. Price \$2.75.

OFFICE IMMUNOLOGY INCLUDING ALLERGY, A Guide for the Practitioner, edited by Marion B. Sulzberger and Rudolf L. Baer. Contributing authors: Marion B. Sulzberger, M. D., *Professor of Clinical Dermatology and Syphilology and Director, New York Skin and Cancer Unit, New York Post-Graduate Medical School and Hospital*; W. C. Spain, M. D., *Clinical Professor of Medicine, New York Post-Graduate Medical School and Hospital*; Rudolf L. Baer, M. D., *Instructor in Dermatology and Syphilology, New York Skin and Cancer Unit, New York Post-Graduate Medical School and Hospital*; Abram Kanof, M. D., *Adjunct Pediatrician, Jewish Hospital, Brooklyn*; Alfred J. Weil, M. D., *Lederle Laboratories Division, American Cyanamid Company*; Naomi M. Kanof, M. D., *Associate Attending in Dermatology, Garfield Memorial and Children's Hospitals, Washington, D. C.* 420 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1947. Price \$6.50.

- PRACTICAL CLINICAL PSYCHIATRY**, by Edward A. Strecker, A. B., A. M., Sc. D., Litt. D., LL. D., M. D., *Professor of Psychiatry, School of Medicine, University of Pennsylvania*; Franklin G. Ebaugh, A. B., M. D., *Professor of Psychiatry, University of Colorado, School of Medicine*; Director, *Colorado Psychopathic Hospital*; Jack R. Ewalt, M. D., *Professor of Neuro-Psychiatry*; Director, *Galveston State Psychopathic Hospital, University of Texas Medical Branch*. Section on Psychopathologic Problems of Childhood, by Leo Kanner, M. D., *Associate Professor of Psychiatry, Johns Hopkins University, School of Medicine*. 6th edition. 476 pages; illustrated. The Blakiston Company, Philadelphia, Pa., publishers, 1947. Price \$5.
- A MANUAL OF THE COMMON CONTAGIOUS DISEASES**, by Philip Moen Stimson, A. B., M. D., *Associate Professor of Clinical Pediatrics, Cornell University Medical College*; Visiting Physician, *Willard Parker Hospital*; Director, *Poliomyelitis Service, The Knickerbocker Hospital*; Medical Director, *The Floating Hospital of St. John's Guild*; Associate Attending Pediatrician, *The New York Hospital*; Consulting Pediatrician, *The Meadowbrook, Bergen Pines, and Norwegian Lutheran Hospitals*. 4th edition, revised. 503 pages; with 67 illustrations and 8 plates, 6 in color. Lea & Febiger, Philadelphia, Pa., publishers, 1947. Price \$4.
- EYE SURGERY**, by H. B. Stallard, M. B. E., M. D. (Cantab.), F. R. C. S. (Eng.), *Assistant Eye Surgeon, St. Bartholomew's Hospital*; Eye Surgeon, *Radium Institute and Mount Vernon Hospital*; Late Surgeon, *Pathologist and Curator, The Royal London Ophthalmic (Moorfields Eye) Hospital*; Major, R. A. M. C. (T. A.). 444 pages; 338 illustrations. The Williams and Wilkins Company, Baltimore, Md., publishers, 1946. Price \$11.
- EXPERIENCES WITH FOLIC ACID**, by Tom D. Spies, M. D., *Associate Professor of Medicine, University of Cincinnati School of Medicine, Director of the Nutrition Clinic, Hillman Hospital, Birmingham, Alabama*. 110 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1947. Price \$3.75.
- AMERICAN MEDICAL RESEARCH PAST AND PRESENT**, by Richard H. Shryock, Ph. D., *Professor of History and Lecturer in Medical History, University of Pennsylvania*; Acting Director, *American Council of Learned Societies*. 350 pages. The Commonwealth Fund, New York, N. Y., publishers, 1947. Price \$2.50.
- SYNOPSIS OF NEUROPSYCHIATRY**, by Lowell S. Selling, M. D., Ph. D., Dr. P. H., F. A. C. P., *Director, Division of Mental Health, Florida Department of Health*; Formerly Attending Neuropsychiatrist, *Deaconess Hospital*; Associate Attending Neuropsychiatrist, *Mt. Carmel Mercy Hospital and Wayne County General Hospital*; Director, *Psychopathic Clinic, Recorder's Court, Detroit, Michigan*; Assistant Professor of Criminology, *Medical Jurisprudence and Social Hygiene, University of Illinois College of Medicine*; Lecturer in Psychology, *Wayne University*; Visiting Professor of Psychology, *Iowa State College*. 2d edition. 561 pages; illustrated. The C. V. Mosby Company, St. Louis, Mo., publishers, 1947. Price \$6.50.
- DIAGNOSTIC BACTERIOLOGY**, A. Textbook for the Isolation and Identification of Pathogenic Bacteria for Medical Bacteriology Laboratories, by Isabelle Gilbert Schaub, A. B., *Instructor in Bacteriology, Department of Bacteriology, The Johns Hopkins University School of Medicine*; and formerly Bacteriologist in Charge of the Diagnostic Bacteriological Laboratory of the Departments of Gynecology and Obstetrics, and the Autopsy Bacteriology Laboratory of the Departments of Pathology and Bacteriology of the Johns Hopkins University School of Medicine; also formerly Instructor in Bacteriology in the Nurses Training School, *The Johns Hopkins Hospital*, and M. Kathleen Foley, A. B., *Instructor in Bacteriology, Department of Biological Sciences, College of Notre Dame of Maryland*; Graduate Student, *Department of Biology, The Johns Hopkins University*; formerly Bacteriologist in Charge of the Diagnostic Bacteriological Laboratory of the Medical Clinic, *The Johns Hopkins Hospital*, 3d edition. 532 pages. The C. V. Mosby Company, St. Louis, Mo., publishers, 1947. Price \$4.50.
- HUMAN GASTRIC FUNCTION**, An Experimental Study of a Man and His Stomach, by Stewart Wolf, M. D., *Assistant Professor of Medicine, Cornell University Medical College, New York Hospital, New York*; and Harold G. Wolff, M. D., *Associate Professor of Medicine, Cornell University Medical College, New York Hospital, New York*. Foreword by Walter B. Cannon, M. D. 262 pages. Oxford University Press, New York, N. Y., publishers, 1947. Price \$5.
- PERSONAL HYGIENE APPLIED**, by Jesse Feiring Williams, M. D., Sc. D., *Emeritus Professor of Physical Education, Columbia University*. 8th edition. 564 pages; illus-

trated. W. B. Saunders Company, Philadelphia, Pa., publishers, 1946. Price \$2.50.

PRINCIPLES OF OCCUPATIONAL THERAPY, edited by Helen S. Willard, B. A., O. T. R., *Director, Philadelphia School of Occupational Therapy*, and Clare S. Spackman, B. S., M. S., in Ed., O. T. R., *Director, Curative Workshop, Philadelphia School of Occupational Therapy and Director, Occupational Therapy Department, Hospital of the Graduate School of Medicine, University of Pennsylvania*; *Assistant Director, Philadelphia School of Occupational Therapy*. 416 pages; with 46 illustrations. J. B. Lippincott Company, Philadelphia, Pa., publishers, 1947. Price \$4.50.

BLOOD DERIVATIVES AND SUBSTITUTES, Preparation, Storage, Administration and Clinical Results Including a Discussion of Shock, Etiology, Physiology, Pathology and Management, by Charles Stanley White, M. D., Sc. D., *former Professor of Surgery, George Washington University School of Medicine*; *Chief of Surgery, Doctors Hospital*; *Consultant to Garfield Hospital, Providence Hospital, and Columbia Hospital, Washington, D. C.*, and to *U. S. Naval Hospital, Bethesda, Md.*, and Jacob Joseph Weinstein, B. S., M. D., *Associate in Surgery, School of Medicine, George Washington University, Associate in Surgery at Gallinger Municipal Hospital and George Washington University Hospital, Washington, D. C.* 484 pages; illustrated. The Williams and Wilkins Company, Baltimore, Md., publishers, 1947. Price \$7.50.

ELEMENTS OF SURGERY, by Fauset Welsh, B. Sc., M. B., F. R. C. S. (Eng.), *Assistant Surgeon to the Birmingham United Hospitals*; *Surgeon to Out-patients*; *The Children's Hospital, Birmingham*. Foreword by Sir Cecil P. G. Wakeley, K. B. E., C. B., D. Sc., F. R. C. S., F. R. S. E., F. A. C. S., F. R. A. C. S., *Fellow of King's College, London*; *Vice President, Royal College of Surgeons of England*; *Senior Surgeon and Teacher of Clinical Surgery, King's College Hospital*; *Consulting Surgeon to the Royal Navy*. 83 pages. Oxford University Press, New York, N. Y., publishers, 1947. Price \$2.25.

A TEXTBOOK OF CLINICAL NEUROLOGY with an Introduction to the History of Neurology, by Israel S. Wechsler, M. D., *Clinical Professor of Neurology, Columbia University, New York*; *Neurologist, The Mount Sinai Hospital*; *Consulting Neurologist, Montefiore Hospital and Rockland State Hospital, New York*. 6th edition. 829 pages; illustrated. W. B. Saunders Company, Philadelphia, Pa., publishers, 1947. Price \$8.50.

HEY GROVES' SYNOPSIS OF SURGERY, edited by Sir Cecil P. G. Wakeley, K. B. E., C. B., D. Sc., F. R. C. S., F. R. S. E., F. A. C. S., F. R. A. C. S., *Fellow of King's College, London*; *Senior Surgeon to King's College Hospital*; *Director of Surgical Studies and Teacher of Operative Surgery, King's College Hospital Medical School*; *Surgeon to the Belgrave Hospital for Children, the West End Hospital for Nervous Diseases, and the Royal Masonic Hospital*; *Consulting Surgeon to the Maudsley Hospital and to the Royal Navy*; *Hunterian Professor and Vice-President, Royal College of Surgeons of England*; *Examiner in Surgery to the Universities of Bristol, Cambridge, Durham, and Sheffield*; *former Examiner in Surgery to the Royal College of Surgeons to the Universities of London and Glasgow, and to the National Universities of Ireland and Wales*; *Temporary Surgeon, Rear-Admiral to His Majesty's Fleet*. 13th edition. 637 pages; illustrated. The Williams and Wilkins Company, Baltimore, Md., publishers, 1947. Price \$6.

A PRACTICAL TEXTBOOK OF LEPROSY, by R. G. Cochrane, M. D., Ch. B. (Glas.), F. R. C. P. (Lond.), D. T. M. & H. (Eng.), *Medical Secretary, Mission to Lepers, Principal, Missionary Medical College, Vellore, S. India*. Hon. Director, *Leprosy Campaign*, and Hon. Director, *Leprosy Research, Madras Presidency*, Hon. Physician in Charge of *Leprosy Departments, General and Stanley Hospitals, Madras*, *Lately Chief Medical Officer, Lady Willingdon Leprosy Sanatorium, Chingleput, S. India*. Foreword by George R. McRoberts, C. I. E., M. D., F. R. C. P., D. T. M. & H., Lt. Col. I. M. S. 283 pages; illustrated. Oxford University Press, New York, N. Y., publishers, 1947. Price \$11.50.

PHYSICAL MEDICINE IN GENERAL PRACTICE, by William Bierman, M. D., *Attending Physical Therapist, Mount Sinai Hospital*; *Assistant Clinical Professor of Medicine, Columbia University*; A chapter on Medical Rehabilitation by Dr. Sidney Licht. 2d edition, revised and enlarged, 686 pages; 310 illustrations. Paul B. Hoeber, Inc., New York, N. Y., publisher, 1947. Price \$8.

BRITISH SURGICAL PRACTICE, in 8 vols. edited by Sir Ernest Rock Carling, F. R. C. S., F. R. C. P., *Consulting Surgeon, Westminster Hospital*, and J. Paterson Ross, M. S., F. R. C. S., *Surgeon and Director of Surgical Clinical Unit, St. Bartholomew's Hospital; Professor of Surgery, University of London*. 636 pages (Vol. I) 575 pages (Vol. II) 524 pages (Vol. III) ; illustrated. The C. V. Mosby Company, St. Louis, Mo., publishers, 1948. Price \$15 each.



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Naval Medical Bulletin



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COVER PHOTOGRAPH

***Navy Nurse Corps dietician checks food on
plates against the diet prescribed for each patient.***

—Official U. S. Navy Photo.

Vol. 49

MARCH-APRIL 1949

No. 2

UNITED STATES NAVAL MEDICAL BULLETIN

THE MISSION OF THE MEDICAL DEPARTMENT OF THE NAVY
TO KEEP AS MANY MEN AT AS MANY GUNS
AS MANY DAYS AS POSSIBLE



BIMONTHLY

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BUREAU OF MEDICINE AND SURGERY
JOSEPH L. SCHWARTZ, Captain (MC) U. S. N., Editor

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NAVY DEPARTMENT,
Washington, March 20, 1907.

THIS UNITED STATES NAVAL MEDICAL BULLETIN is published by direction of the Department for the timely information of the Medical and Hospital Corps of the Navy.

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PREFACE



The UNITED STATES NAVAL MEDICAL BULLETIN was first issued in April 1907 as a means for supplying Medical Department personnel of the United States Navy with information regarding the advances which are continually being made in the medical sciences, and as a medium for the publication of accounts of special researches, observations, or experiences of individual medical officers.

With the establishment of the Nurse Corps in 1908, the Dental Corps in 1912, and the Medical Service Corps in 1947, the function of the BULLETIN was broadened to serve in a similar capacity for members of those Corps.

It is the aim of the Bureau of Medicine and Surgery to furnish in each issue special articles relating to naval medicine and dentistry, editorial comment on current literature of special professional interest to Medical Department personnel, clinical notes on interesting cases, descriptions of suggested devices, reports from various sources, notes and comments on topics of professional interest, and notices of newly published professional books.

The Bureau extends an invitation to all officers of the Medical Department to prepare and forward, with a view to publication, contributions on subjects of professional interest.

The Bureau does not necessarily undertake to endorse views or opinions which may be expressed in the pages of this publication.

CLIFFORD A. SWANSON,
Surgeon General, United States Navy.

III

NOTICE TO CONTRIBUTORS



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All original contributions are accepted on the assumption that they have not appeared previously and are not to be reprinted elsewhere and that editorial privilege is granted to the Bureau of Medicine and Surgery in preparing all material submitted for publication. Authors are urged to keep their papers short.

JOSEPH L. SCHWARTZ, *Editor,*
Captain, Medical Corps,
United States Navy.

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Fellow Officers of the Medical Department:

Pharmacy was introduced simultaneously with the creation of the Navy by the Continental Congress in 1775. The Navy has had the advantage of good practical pharmacy since then.

In the recent decades, as a result of research and technologic advances, many changes have been made in drug therapy, therapeutic agents, and technique. Synthetic organic compounds and the newly introduced antibiotics, all of great potency and high therapeutic value, are rapidly replacing many of the pill and powder vegetable compounds of the *materia medica*. The Syrette, the carpule and the recently developed "hypo-spray" are displacing older methods of parenteral medication.

Medical progress now requires that pharmacy in the Navy shall be on the highest scientific plane. In 1947 the U.S. Congress laid the foundation for this by including pharmacy as one of the allied professions of the newly established Medical Service Corps. Public Law 716 authorizes the direct appointment of qualified civilian pharmacists to the regular Navy.

Pharmacy officers will serve in their professional capacity to supervise the modernization, expansion and operation of pharmacies in naval hospitals and major dispensaries. They will be assigned to duty in the various technical services of the Medical Department and in various Navy schools where their training can be most advantageously employed. After indoctrination pharmacy officers may be detailed to any duty for which they may be individually qualified.

Modern pharmaceutical education provides a broad technical background upon which to develop useful and resourceful officers who can serve the Medical Department in diverse fields. Their duties in such capacities will enable the Medical Department to advance the already high type of Navy medical care to a position of pre-eminence.

Sincerely,

A handwritten signature in cursive script, reading "C. J. Swanson".

Rear Admiral, Medical Corps
Surgeon General, U.S. Navy

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ARTICLES



The Clinical Manifestations of Acute Radiation Illness in Goats

Comments on Therapy¹

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THE rate of delivery of ionizing radiation by explosion of an atomic bomb in air cannot be duplicated by other means such as x-ray tubes, radium, artificial radioisotopes, cyclotrons, or a chain reacting pile because of their inadequate output and small radiation fields. A unique opportunity to study the effects of high intensity, short duration, penetrating ionizing radiations upon animals was provided by the explosion of the atomic bombs during Operation Crossroads.

The effects of ionizing radiation on biologic systems have been studied intensively since 1905. In many respects the field still remains controversial. Among the factors that confuse the literature are: The varied species response; the diverse means by which the radiation was administered; the difficulty in estimating the amount of radiation that is absorbed by tissue; and the great difference in the rate which radiation was delivered. Furthermore, until recent years investigators were more concerned with the general effects of localized therapeutic radiation. In the last few years radiologists have studied total body exposure in animals, the effects of low-intensity, long-exposure x-ray baths in leukemias and allied disorders, and

¹ From the Naval Medical Research Institute, Bethesda, Md.

multiple port large area radiation in therapy of human disease. With the advent of the atomic bomb, attention was focused upon the effects of diffuse, single, and short duration intense exposure of the whole body of man and animals.

Excellent reviews of the literature exist. Selling and Osgood (1) and Warren (2) adequately cover the period 1905-41. Since then the declassified reports of the Manhattan Engineering District have been available (3) (4) (5).

MATERIAL AND METHODS

During the air atomic bomb explosion at Bikini, goats were exposed to very high intensity, short duration gamma radiation and to a lesser extent some were exposed to fast and slow neutron radiation.

The goats were protected by varying degrees of shielding as described by Draeger and Warren (6) and Tullis and Warren (7). The goats considered in this report are those that were exposed to ionizing radiation in amounts ranging from 100r to more than 10,000r. Animals with burns and traumatic injuries are omitted. Complete blood counts, hemoglobin and hematocrit determinations, platelet counts, prothrombin time, whole blood coagulation time, capillary fragility, indirect heparin titrations with toluidine blue, and physical examinations were performed daily until changes became less rapid, and then the examinations were spaced at progressively longer intervals. In this report the results and discussion will be limited largely to clinical signs, leukocyte counts, and hematocrit readings. Amorphous penicillin was administered subcutaneously to some of the goats in four 125,000-unit doses per day for a daily total of 500,000 units.

Transfusions were given to some goats as follows. Standard Navy human blood transfusion vacuum bottles containing citric acid, citrate, and dextrose (ACD mixture) were used to obtain blood from large male Angora goats. The blood was immediately administered to the recipient goats in amounts varying from 150 to 500 cc.

RESULTS

All surviving goats were recovered and returned to the laboratory ship before the end of the third day after the atomic bomb explosion. Some were recovered a few hours after the explosion. All goats on recovery were active and eating. Some exhibited an increased irritability.

The goats can be divided into four distinct groups based on the severity of their illness, particularly the depression of their leukocyte

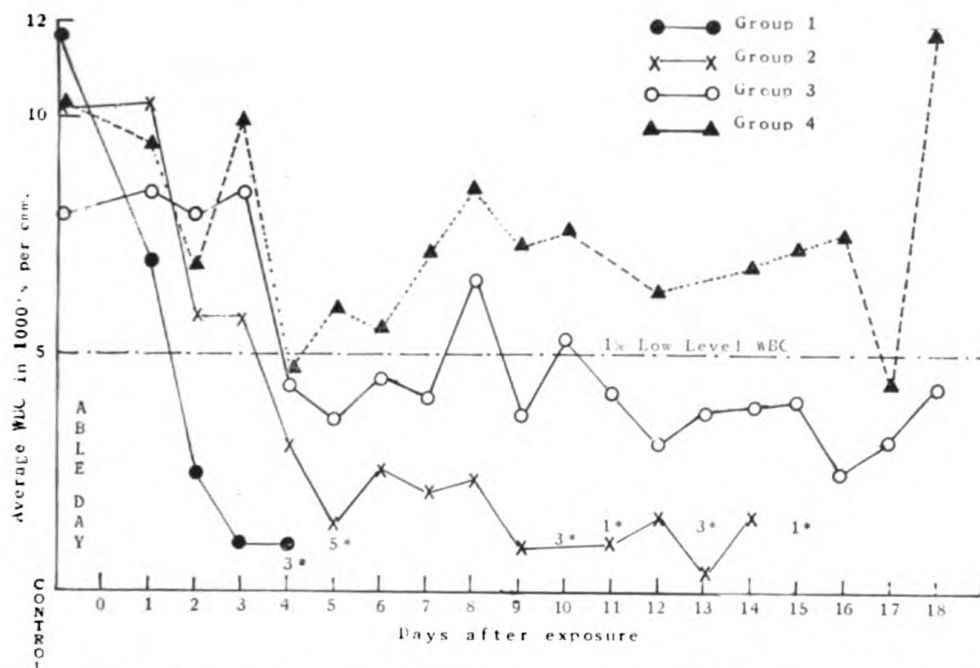


Figure 1.—Graph of the average leukocyte count for groups 1, 2, 3, and 4 showing the distinct differences in the leukocyte counts for each group. Asterisk designates deaths.

counts. There are also distinct differences in the survival time and mortality. However, these may have been modified by the therapy. In figure 1 the relationship between the leukocyte counts and survival time is seen. The shorter the survival time, the greater the rate of fall and the greater the depression of the leukocyte count.

TABLE 1.—Signs of irradiation illness in goats of group 1 according to appearance in days after exposure to an atomic bomb air explosion

Goat No. ¹	Loss of appetite	Apathetic	Diarrhea	Rhinitis	Petechia	Epiletion	Sudden death	Survival time ²
12	3	3	4				No	5
119	3	3	3				No	4
122	3	3	3				No	5
159	3	3	3				No	5
32	2	2	2				No	4
47	2	2	2				No	3
20			4	4			Yes	5
46 ³	3	3	3	5			Yes	4

¹ Refers to Bikini test number.

² Average 4.3 days.

³ Not recovered until third day. All others recovered on first or second day.

Group 1, severest radiation illness.—This group consisted of eight goats that had the most marked depression in their leukocyte counts. When recovered from the target ships these animals were lively and ruminating. Some observers believed they were more irritable than

usual. After a latent period of 2 to 3 days (during which there were no signs of illness) diarrhea, loss of appetite, and apathy appeared. These symptoms persisted until the animals died between the third and fifth days after the explosion. Two goats died suddenly and unexpectedly. A serious rhinitis appeared in two goats. Epilation and external evidence of hemorrhage did not appear in this group (table 1). At autopsy petechial hemorrhages of the bowel were seen among other lesions.

The consistent hematologic findings were a marked hemoconcentration and an extreme leukopenia (fig. 2). An abortive increase in leukocyte counts before death was present in three goats. The blood smears revealed normal red cells, normal platelets, and an almost complete absence of leukocytes. The clotting time and prothrombin time

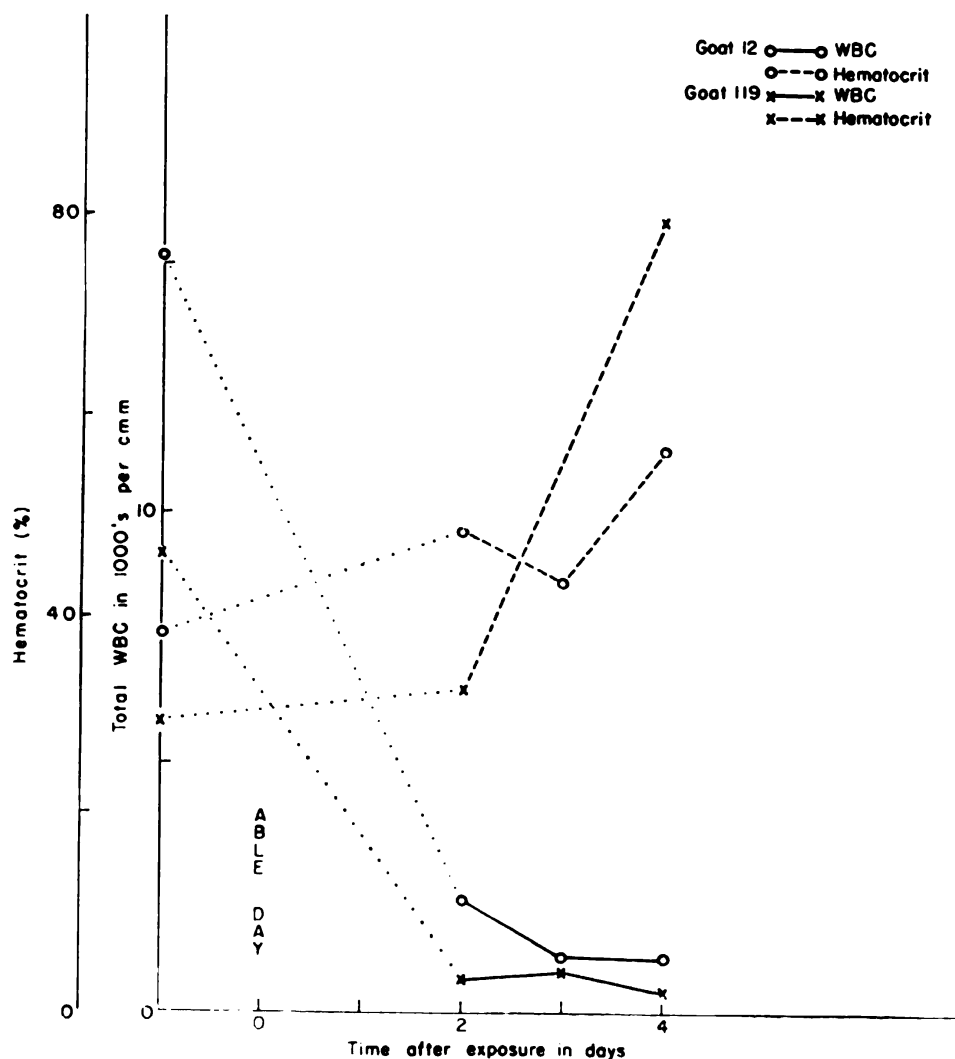


Figure 2.—Characteristic changes in the total leukocyte count and the hematocrit value for two goats of group 1.

of this group were not studied. Blood was found to be clotted in the vessels at autopsy immediately after death. It is emphasized that hemorrhage was not a prominent sign in this group. None of these animals were treated and the entire group died.

Group 2, severe radiation illness.—This group consisted of eight goats that had a depression in their leukocyte counts as marked as those of group 1, but not as rapid (fig. 1). Illness began after a latent period of 3 to 7 days. These goats developed many signs of illness (table 2); among the first to appear were apathy, diarrhea, and loss of appetite. Serous rhinitis, petechiae, and epilation followed shortly thereafter. All these signs, however, except bloody diarrhea, were not present in each goat. The goats survived for a period of 9 to 15 days.

TABLE 2. *Signs of irradiation illness in goats of group 2 according to date of appearance after exposure to an atomic bomb air explosion*

Goat No. ¹	Days after air explosion							
	Loss of appetite	Apathetic	Diarrhea, bloody	Rhinitis	Petechiae	Epilation	Sudden death	Survival time
150	3	3	3		8	9	No.	15
111	3	3	5	8		8	Yes	9
108	7	11	13	8	11	7	Yes	13
57	7	5	15	11	7	11	Yes	12
54	8	7	9	12	12		No	13
60	7		8			7	Yes	10
49		7	8	8			No	10
52		7	7			9	Yes	10

¹ Refers to Bikini test number.

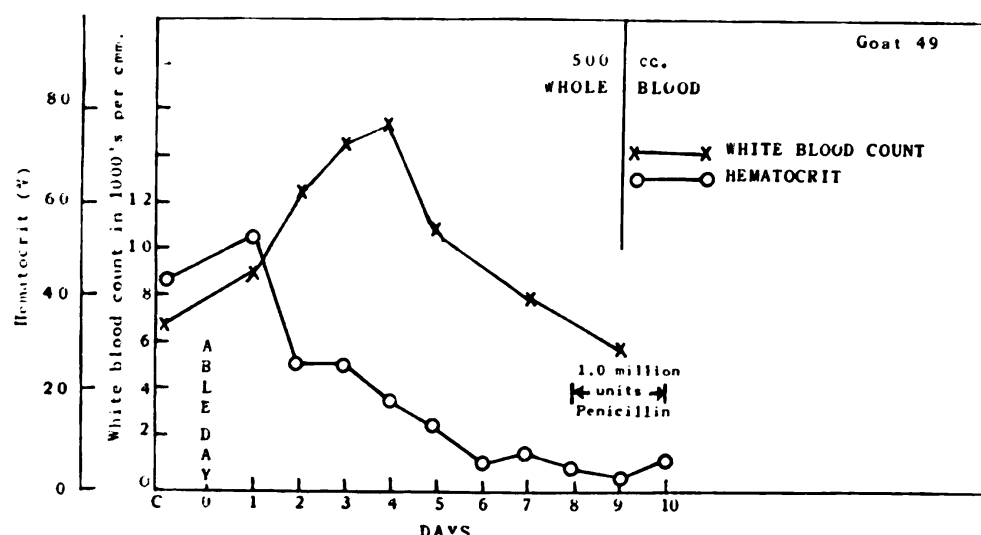


Figure 3.—Response of the hematocrit readings and the leukocyte counts in goat 49, group 2, and the relationship to blood transfusions and penicillin therapy.

Hematologic changes of a member of this group are shown in figure 3. The hematocrit readings generally increased during the first few days after exposure. In goat 49 this was particularly pronounced and attained a peak of 72 percent, on the fourth day, which was followed by a progressive decrease (fig. 3). The leukocyte count was elevated above the preexposure count on the first day in three goats, but then progressively dropped with exception of a temporary increase which appeared for a short time in all goats between the fourth and eighth days after exposure. After this temporary increase, the leukocyte count fell and remained at very low levels until death.

All goats of this group received penicillin and blood transfusions beginning between the seventh and tenth days after exposure and continued daily until death (table 3). The clinical signs and blood counts may have been altered after the onset of therapy; however, leukocyte counts continued downward after the start of the transfusions. There is no evidence that the transfusions increased the leukocyte levels. The hematocrit readings apparently were favorably influenced by transfusion in the late stages in goat 150, although the increase in the hematocrit readings may have been due to terminal dehydration.

TABLE 3.—*Therapy administered to group 2*

Goat No.	Days after exposure penicillin started	Total units penicillin	Days after transfusion started	Total volume blood, in cc.	Number of transfusions	Survival time, days
150	8	3.5×10^6	8	1,950	7	15
111	8	1.0×10^6	8	250	1	9
108	7	3.5×10^6	8	850	5	13
57	7	3.0×10^6	7	950	5	12
54	9	2.5×10^6	10	550	2	13
60	7	2.0×10^6	8	1,000	2	10
49	8	1.0×10^6	9	500	1	10
52	8	1.0×10^6	8	300	2	10

Changes in the blood coagulation and prothrombin time were variable for the goats of this group and generally appeared after the beginning of therapy (tables 3 and 4). The blood became incoagulable in two goats (150 and 49). This increased coagulation time was accompanied by a moderate increase in the one-stage prothrombin time. A temporary beneficial effect of blood transfusion on coagulation time was observed in goat 150 on the tenth day after exposure when the blood would not coagulate spontaneously. After a single 500 cc. transfusion the blood coagulability in this goat was increased temporarily. Subsequent transfusions did not exert this beneficial effect, and on the last day of life blood coagulation time was 65 minutes. Special coagulation studies will be reported separately (8).

TABLE 4.—*Tabulation of whole blood coagulation time and prothrombin time in goats of group 2*

Goat No.	Days after air blast									
	5	6	7	9	10	11	12	13	14	15
150 CT	10'	9'	12'		14'	1C*	28'	39'	20'	65'
PT	13"	13"	10"		14"	16"	12"	12"	12"	10"
111 CT	10'	7'			Died					
PT	11"	14"								
108 CT				19"	7'	20'		Died		
PT				15"	15"	14"				
57 CT			12'		20'	9'	21'	Died		
PT			10"		19"	15"	15"			
54 CT					13'		15'	Died		
PT					15"					
60 CT										
PT										
49 CT	8'				1C*	Died				
PT	1 "				45"					
52 CT		9'								
PT		13"				Died				

CT—Clotting time of whole blood. Normal mean, 8.8 minutes. Range, 4 to 15 minutes.

PT—1-stage prothrombin time. Normal mean, 13.2 seconds. Range, 9 to 18 seconds.

1C—Incoagulable.

* After transfusion of 500 cc. coagulation time was 25'.

Goats 150, 108, and 57 which received more transfusions lived a few days longer (table 3); however, there was no control group with which to compare survival.

Group 3, less severe radiation illness.—This group consisted of six goats that had a moderate depression of their white blood count intermediate between groups 2 and 4. All animals in this group were intensively treated with penicillin and transfusions. Two are alive 1½ years after exposure.

Signs progressively appeared between the third and sixteenth days after exposure but the tempo at which they increased was much slower than in the previous groups. The signs persisted for a lesser period of time and appeared and disappeared in a random manner (table 5).

The progressive appearance and persistence of signs that preceded death in groups 1 and 2 were absent in this group. Only goat 135 developed all of the stigmata of radiation illness. This goat was still alive 1½ years after exposure. Loss of appetite developed in four of the six goats between the third and fifth days, but lasted only 2 to 4 days. Apathy was present in four of the six goats for a period of 2 to 5 days. Diarrhea occurred in all of the goats beginning between the third and fourteenth days after exposure and persisted for 2 to 12 days. Serous rhinitis developed in four of six goats between the third and fourteenth days and existed for 2 to 5 days. Petechiae were prominent in all of this group, becoming apparent 7 to 16 days after exposure, a much later onset than in group 2. There was only a slight degree of epilation. All signs of illness disappeared after the twenty-first day except moderate alterations in

TABLE 5. — *Tabulation of signs of irradiation illness and therapeutic measures in goats of group 3 according to onset and duration after exposure to an air atomic bomb explosion*

Goat No.	Days after explosion														
	Loss of appetite			Apathy		Diarrhea		Serous rhinitis		Petechiae		Epilation		Death anticipated	Survival time
	Ap- peared	Dura- tion	Ap- peared	Dura- tion	Ap- peared	Dura- tion	Ap- peared	Dura- tion	Ap- peared	Dura- tion	Ap- peared	Dura- tion			
121	3	2	3	3	3	3	10	3	5	16	5		No	44	
37						7	6			7	8	9	No	80	
124						14	8			12	6	12	No	186	
63	5	4	5	5	5	5	12	12	2	16	4		No	545	
136	3	3	3	3	3	4	3	14	3	14	5		Alive		
135	3	3	4	2	2	3	2	9	3	7	7	10	Alive		

TREATMENT											
Goat No.	Blood transfusion				Penicillin						
	Started in days after	Stopped days after	Total	Total volume of blood	Started days after	Stopped days after	Total units received				
121	14	143	15	3,100	10	Death	17				
37	9	180	34	7,200	8	Death	36				
124	14	180	50	9,650	8	Death	37.5				
63	14	90	48	9,950	7	60	37.5				
136	14	90	49	10,150	7	60	37.5				
135	9	90	50	10,300	7	60	37.5				

1. At death.

the white blood count. Four of the six goats died unexpectedly between the forty-fourth and five hundred and forty-fifth days.

The changes in the white blood count were not nearly so great as in groups 1 and 2. Most of the goats developed a moderate leukocytosis for 2 to 3 days before the leukopenia developed. All the goats demonstrated a temporary partial recovery in leukocyte counts between the sixth and ninth days.

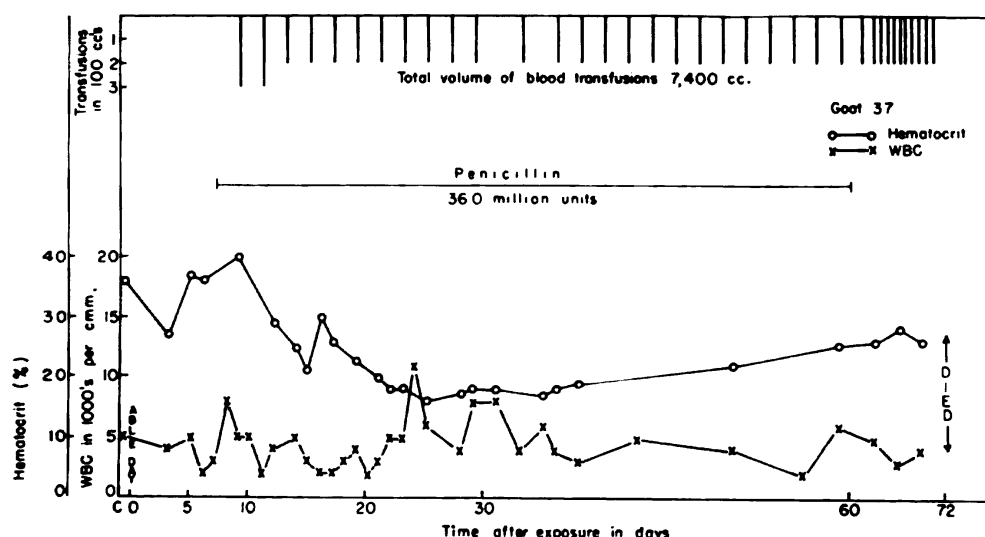


Figure 4.—Response of the hematocrit readings and the leukocyte counts in goat 37, group 3, and the relationship to blood transfusions and penicillin therapy.

The hematocrit readings increased during the first 5 to 10 days after exposure and then fell slowly or remained at a lower level than the preexposure hematocrit reading despite repeated transfusions.

Figures 4 and 5 show the blood changes for goats of this group. The erratic course of the leukocyte count after the characteristic early

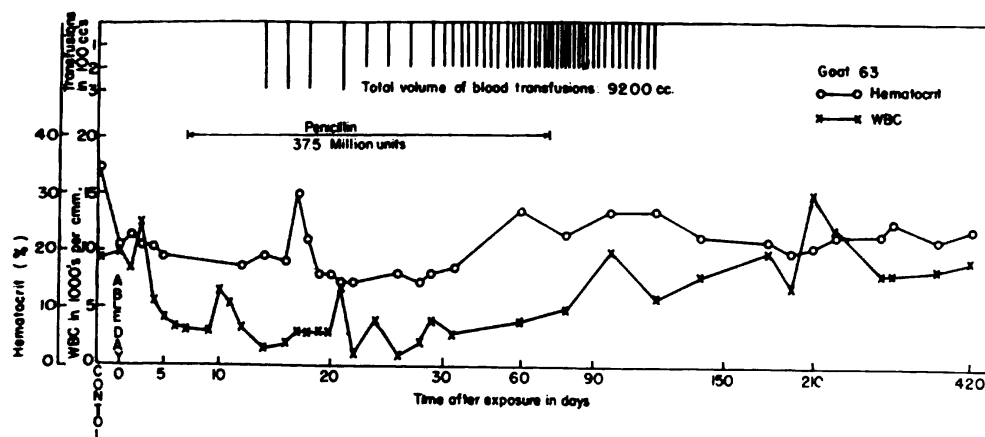


Figure 5.—Response of the hematocrit readings and the leukocyte counts in goat 63, group 3, and the relationship to blood transfusions and penicillin therapy.

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TABLE 6.—*Tabulation of signs of irradiation illness and therapeutic measures in goats of group 4 according to onset and duration after exposure*

Goat No.	Loss of appetite		Apathy		Diarrhea		Serous rhinitis		Petechiae		Eplation		Death ex- pected	Survival time
	Appeared	Duration	Appeared	Duration	Appeared	Duration	Appeared	Duration	Appeared	Duration	Appeared	Duration		
118	5	2	5	2	6	2							No	184
4	5	1	5	1	6	2							No	313
8	5	1	5	1	6	2							No	291
22	5	1	5	1									Alive	Alive
61	5	1	5	1									Alive	Alive
426	55	1			66	1							Alive	Alive
97			4	1	4	1							Alive	Alive
80	4	2	4	4	6	4							Alive	Alive
100					10	2							Alive	Alive
TRANSFUSIONS														
Goat No.	Loss of appetite		Apathy		Diarrhea		Serous rhinitis		Petechiae		Eplation		Total	Total volume of blood in cc.
	Appeared	Duration	Appeared	Duration	Appeared	Duration	Appeared	Duration	Appeared	Duration	Appeared	Duration		
118													169	49
4													167	48
														10,450
														10,200

changes is apparent. All the goats in this group developed large numbers of immature red cells and degenerating white cells in the peripheral blood between 13 and 30 days after exposure. Alterations in blood coagulation time were not observed in this group.

Large amounts of blood and penicillin (table 5) were given to all these animals beginning between the ninth and fourteenth days after exposure. Single deaths occurred on the forty-fourth, eightieth, one hundred and eighty-sixth, and five hundred and forty-fifth days. Two goats are still alive. Goat 121 died with a fulminating gas bacillus infection characterized by marked intravascular hemolysis. Cause of death was not apparent in the remaining three. The relationship of penicillin and blood transfusion to the hematocrit reading and leukocyte counts is seen in figures 4 and 5.

Group 4, mild radiation illness.—This group consisted of nine goats that had a very small and short-lived depression of their leukocyte counts. The illness became apparent after a latent period of 4 to 5 days before any signs were detected except for a very slight depression of leukocytes. Six of the nine lost their appetite for a period of 1 to 2 days. Seven of the nine were apathetic for a period of 1 to 4 days. Five were dull for only 1 day. Seven of the nine developed diarrhea between the fifth and tenth days which lasted only 1 to 4 days. It was not bloody. Rhinitis, petechiae, and epilation did not appear. There were no deaths before the one hundred and eighty-fourth day. Six are alive 1½ years after the exposure (table 6). The cause of death for the three that died is not known.

The hematologic changes of two goats are seen in figures 6 and 7. There was considerable difference in the rate at which the leukocyte count decreased. The lowest average count was attained on the fourth day; however, some goats attained their lowest count as late as 7 days after exposure. Recovery was much more rapid in this group. Figures 6 and 7 demonstrate the erratic course of the leukocyte count following exposure.

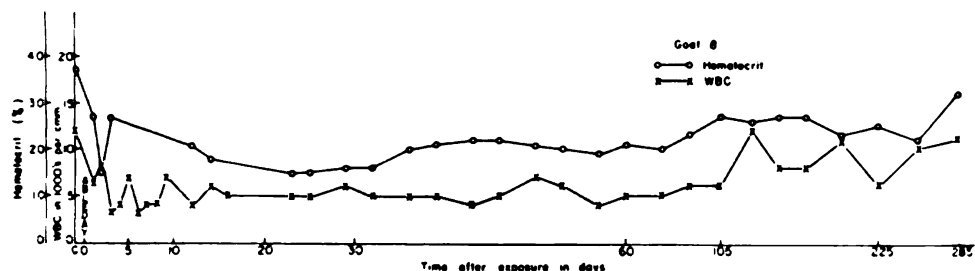


Figure 6.—Response of the hematocrit readings and the leukocyte counts in goat 8, group 4. No therapy.

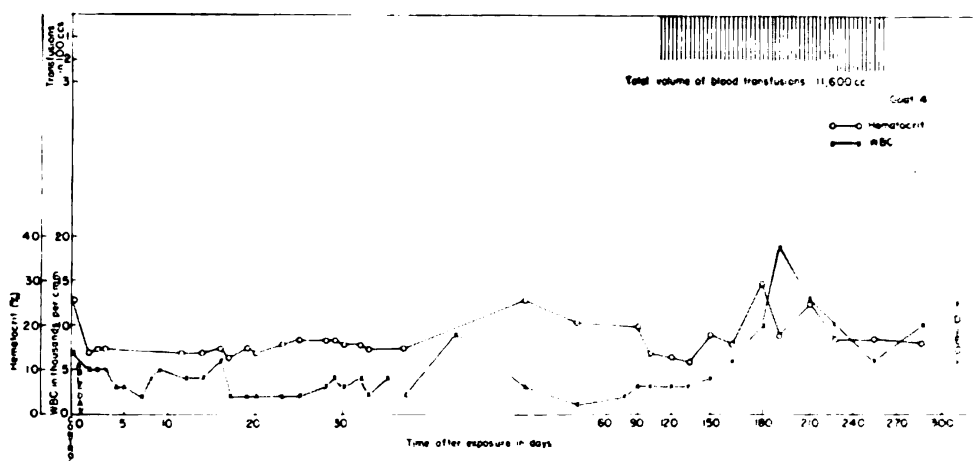


Figure 7.—Response of the hematocrit readings and the leukocyte counts on goat 4, group 4, in relation to blood transfusions.

Hematocrit readings are shown on the same figures. Goat 8 received no treatment at all. The hematocrit reading decreased progressively from a control value of 37 percent to 18 percent 24 days after exposure. It returned to normal after about 250 days but the goat died 291 days after exposure. Goats 4 and 118 similarly had a decrease in hematocrit readings during the early period attaining their minimum values around 20 days after exposure. About 90 days after exposure these goats seemed to be failing. White counts were low and the hematocrit values decreased again. Transfusions were begun. Rectal temperatures remained in the normal range. A total of 11,600 cc. of blood was given to goat 4 over a period of 71 days with a temporary increase in the hematocrit reading. Following cessation of transfusions there was a slow decrease in the hematocrit reading and the animal died 313 days after exposure. Goat 118 received 10,450 cc. of blood between the ninety-sixth and one hundred and sixty-ninth days after exposure. The hematocrit reading returned to normal during this period. Fifteen days after transfusions were stopped the goat died. The other goats of group 4 are alive but were not treated.

There were 22 goats that were never exposed to radiation and that had been aboard the laboratory ship at all times. In this group there were no spontaneous deaths during the first 1½ years after the explosion. The hematologic data are inadequate but there were no obvious changes in the hematocrit readings such as were seen in groups 1, 2, 3, and 4. Leukocyte changes were less than those observed in the four groups described above. This is not a true control group because it was not subjected to all of the hazards of transportation and handling to which the irradiated goats were subjected.

The rate at which leukocytes disappeared and their rate of recovery will be covered in a separate report (9).

DISCUSSION

The desirability of correlating the clinical manifestations and mortality with specific amounts of radiation is unquestioned. However, because of factors beyond the control of the physicists this was not possible. The best estimate of amounts of radiation received by the groups of goats previously described is as follows: group 1 received over 1,000r; group 2 received approximately 1,000r; group 3 received less than 1,000r but more than 100r; group 4 received almost 100r of very penetrating radiation in less than a few seconds.

From an analysis of the data that are available it is apparent that the mortality, the survival time, the appearance and duration of signs, the tempo at which radiation illness progresses, blood counts, and blood coagulation defects are in a general sense related to dosage of ionizing radiation.

The latent period, that period before the onset of visible signs of radiation illness, becomes shorter with increasing amounts of radiation. The length of the latent period is closely related to the severity and number of signs. With overwhelming radiation the latent period is very short, the signs that develop are severe, and death comes promptly (10) (11). However, an insufficient period of time elapses between exposure and death for all characteristic signs to develop. This is demonstrated in group 1 where signs appeared on the second and third days after exposure but hemorrhage and epilation did not occur to any great extent. However, in group 2 that received considerably less radiation, signs developed more slowly, were more numerous and severe, particularly the hemorrhagic phenomena and epilation. In group 3, signs came on even more slowly, but were not so severe and not as extensive. Group 4 had the longest latent period and the fewest signs of illness. It is apparent then that there is a critical dosage above and below which the complete picture of acute total body radiation illness fails to develop.

Prolongation of blood coagulation time appeared in two goats of group 2. In the other groups alterations in blood coagulation were not observed. This suggests that there must be a critical amount of radiation injury to tissues plus a definite lapse of time for the coagulation defect to develop. This will be considered more in detail in another report (8).

The rate of decrease and the depth to which the leukocyte count falls apparently are related to the amount of radiation received. There is a clear-cut difference between the pooled leukocyte counts of groups 1, 2, 3, and 4 (fig. 1). The characteristic changes, for example

the eighteen and twenty-four hour leukocyte peaks, observed by Jacobson et al. (3) in rabbits were not detected in the goats, probably because blood counts were not performed soon enough or often enough. In the goats that survived more than 30 days, total white blood counts began to return to normal around 16 to 18 days after exposure but ran a very erratic course, sometimes dropping under 1,000 per cm. These sudden leukopenias may have been a result of mild asymptomatic transfusion reactions. Farr (12) has observed marked leukopenias after homologous transfusions in men and rabbits. Pyrogens are known to cause sudden leukopenias. Pyrogen contamination of transfusion equipment may easily have occurred under the field conditions that existed aboard ship.

Radiation illness is commonly thought to consist of two main phenomena: hemorrhage, and bacterial infection which frequently follows the agranulocytosis. These combined phenomena appear in the critical dose ranges; both may be absent with overwhelming dosage and with low dosage. Furthermore, hemorrhagic phenomena have recently been intimately linked to a blood coagulation defect with a circulating anticoagulant that has heparinlike properties (5). This is not invariably true and will be considered in greater detail (8).

Prognostic signs for recovery or death are not clearly defined. The leukocyte counts are of some assistance. A rapid decrease to under 2,000 in the first 48 hours was usually followed by death before the sixth day. Most goats whose leukocyte counts remained above 2,000 per cm. during the first 6 days survived. The appearance of signs, particularly diarrhea, on the second and third days warrants a bad prognosis. Epilation was followed by death in all except one goat. (A greater percentage of Japanese with epilation survived at Hiroshima and Nagasaki.) In general, goats that died ran a more rapid course in respect to the development of symptoms than did the Japanese (13) (14).

The deaths that occurred in the first 6 days might be considered as largely radiation deaths. Deaths between 9 and 15 days were a combination of direct effects of radiation, bacterial invasion that followed the agranulocytosis, and hemorrhage. The late deaths in groups 3 and 4 are difficult to evaluate, but they are probably not related to radiation injury.

The course and symptoms of radiation disease in goats is very similar to that seen in the Japanese (13) (14) with the exception that the progress of the illness was more rapid in goats than in man. Goats, as ruminants, cannot vomit; so vomiting was not seen on the day of atomic bombing as so commonly appeared in the Japanese at Hiroshima and Nagasaki.

Therapeutic endeavors were concentrated on transfusions and penicillin. Transfusions were used because of the following reasons: red blood cell formation ceases for a variable period; red blood cell destruction is increased as manifested by erythrophagocytosis and an increased urobilinogen excretion (2) (15). These reasons clearly indicate that transfusions are needed for replacement of the red blood cell deficit. The data reported here show rather well that despite repeated transfusions there was very little increase in the hematocrit values. In addition, if blood is given immediately some viable white blood cells will be received along with the immune gamma globulins that may assist in combating the infections which commonly occur if the animal survives sufficiently long. Prolonged infections will promote the development of anemias because of interference with iron metabolism (16). Hence, penicillin was used both prophylactically and therapeutically. Penicillin was not started until 7 to 10 days after exposure and was continued approximately 50 days or until death occurred. Penicillin was stopped at this time because granulocytes had reappeared in appreciable numbers and because the goats appeared quite healthy. In retrospect it seems desirable to start penicillin and transfusions immediately after exposure, so that these agents may be able to exert some beneficial effect during the latent period and perhaps prevent the development of infections and anemia. Evaluation of therapy is not possible because of the absence of a sufficient number of comparably exposed animals to form a control group. Spontaneous deaths did not occur in the nonexposed control group during the first year. At the present time one may infer that the use of penicillin and transfusions may have prolonged survival in groups 2 and 3. Transfusion had a temporary beneficial effect upon blood coagulation in one goat. The relationship of penicillin to blood coagulation will be considered in detail in another report (8). The late transfusions may have been harmful in group 4 where only the treated animals died.

SUMMARY AND CONCLUSIONS

1. Goats exposed to the atomic bomb ionizing radiations are divided into four groups on the basis of the severity of the illness and their leukocyte response to the radiation.

Group 1, severest radiation illness, survived less than 6 days and developed an extremely marked depression of the leukocyte count and very severe signs. Sudden death was observed. There was no visible evidence of hemorrhage during life. Epilation was not seen. The mortality was 100 percent.

Group 2, severe radiation illness, survived 9 to 15 days and developed a less marked leukopenia. Signs were severe but appeared less rapidly.

Definite hemorrhagic manifestations with a variable clotting defect occurred. Epilation was prominent. Mortality was 100 percent.

Group 3, less severe radiation illness, survived in excess of 44 days. Two are alive 1½ years after irradiation. The signs were similar to group 2 but developed with less rapidity and severity. A moderate leukopenia was present. Hemorrhagic phenomena were less prominent and a clotting defect was not found. Epilation was minimal.

Group 4, mild radiation illness, survived in excess of 184 days. Six of nine are alive 1½ years after irradiation. Signs were mild and of short duration. Hemorrhage, epilation, and rhinitis were absent.

2. The clinical picture in goats exposed to atomic bomb radiation is similar to that of man except for the absence of vomiting and the more rapid progression of signs.

3. Early appearance and rapid progression of signs presages an early death.

4. Penicillin and whole blood transfusions were used therapeutically. For lack of comparably exposed control animals definite conclusions cannot be drawn about the usefulness of these agents. The data suggest that they may be of value.

ACKNOWLEDGMENTS.—The author is deeply indebted to Capt. R. H. Draeger (MC), U. S. N., officer in charge; Capt. S. Warren (MC), U. S. N. R., executive officer; and Commander John L. Tullis (MC), U. S. N., pathologist, Naval Medical Research Section, Operations Crossroads, for their guidance and assistance, and to C. R. Sipe, HMC, U. S. N. for preparation of graphs and tables.

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Suction Socket For Above Knee Prosthesis

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THE suction socket utilizes the principle of slight negative pressure. Vacuum created in the closed bottom of the socket holds the prosthesis on the stump. The muscles of the stump control the movements of the artificial leg. No pelvic joint and belt, or shoulder harness is necessary (fig. 1).

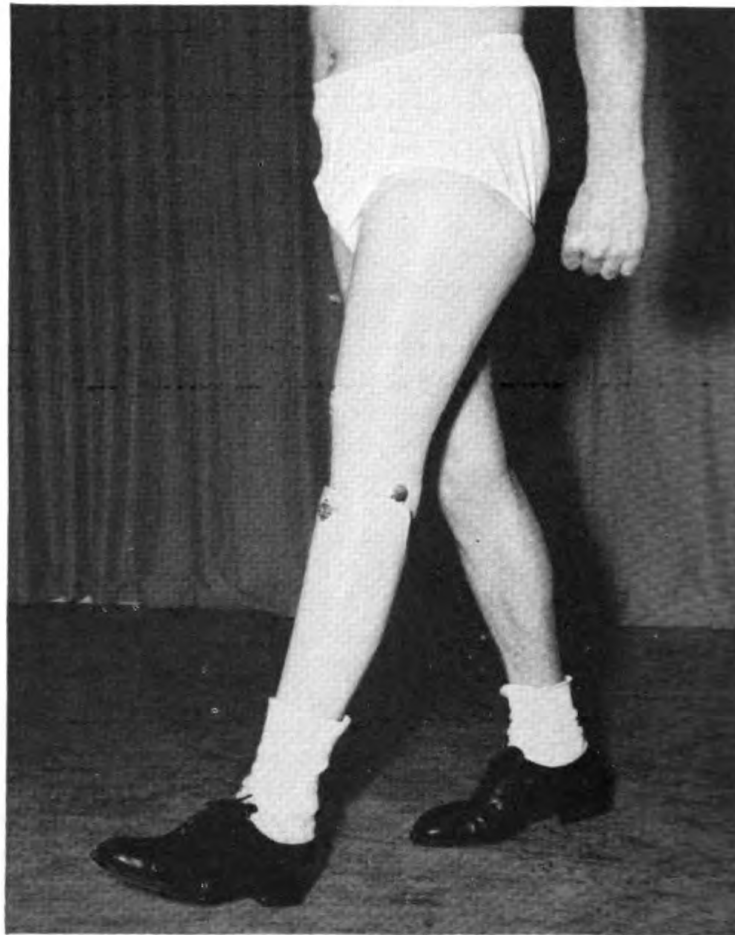


Figure 1.—Suction socket prosthesis in use.

An enclosed space of about 6 to 8 cubic inches is made in the bottom of the socket between the end of the stump and the enclosed end of the socket. A snug, circumferential fit is necessary, especially at the top of the socket. This acts as an air seal and when the leg is lifted from the ground, the air pressure in the enclosed space falls to about 2 pounds per square inch negative pressure, thus retaining the stump in the socket. An expulsion type valve is fitted into the air space to allow air to be expelled when the stump is weight bearing in the socket. No stump sock is worn.

HISTORY (1)

The first suction socket on record was developed and patented by Dubois D. Parmalee of New York in 1863. It utilized the fundamental principles used in the suction socket of today.

A patent for a similar prosthesis was issued to George C. Beacock and Terance Sparham of Brockville, Canada, 10 November 1865.

Justin Kay Toles of Stockton, Calif., in 1911, evolved a combination suction socket with a valve and a rubber tube and bag lining. When inflated it aided in holding the socket on the stump.

Ernest Walter Underwood of England was issued a United States patent in 1926 for a suction socket that had smooth helical grooves which, he claimed, assisted in holding the limb on the stump and also ventilated it.

Medical literature contains few references to the suction socket. Little (2) in 1926 reported favorably on the use of suction sockets for above knee amputations in 11 cases. This socket was designed by Blatchford. It was made of metal and contained a smooth helical groove a little more than one turn around the circumference of the socket. Papers by Felix (3); Kirschner and Dittert (4); Burchardt et al. (5); and Gocht, Radike, and Schede (6), have appeared in German medical literature dealing with suction socket prostheses.

Twenty years ago at Roehampton, England, 30 metal suction sockets were fitted to above-knee amputees and some of these patients are still wearing these sockets. Hanger, of Roehampton, in *Solvitur Ambulando*, comments on the suction socket, warning that there is grave risk in the use of suction as a means of attaching an artificial leg, and that he prefers the conventional methods of suspension.

According to Pfau, in Berlin, the suction socket has been used in Germany for more than 25 years. Gesterle, in Ulm, 15 years ago, is credited with popularizing the suction socket. It was discontinued chiefly because a satisfactory valve could not be constructed. In 1932 Felix, a surgeon of Dusseldorf, revised the suction socket and began work on a new type of valve. He reported his observations in 1941 (3) emphasizing the fact that the suction socket could not be used in

all above-knee amputations. Kirschner and Dittert (4) reported 39 cases; their impressions were similar to those of Felix.

The Army Surgeon General's European Commission on Amputation and Prostheses (7) visited Germany in 1946 and found that the suction socket for above-knee amputations was used extensively in the United States occupation zone. A few suction sockets had been unsuccessfully applied to below-the-knee amputees and no cases using arm-suction sockets were seen. It has been estimated that over 10,000 above-knee amputees have been fitted with suction sockets in Germany.

In the United States, the Committee on Artificial Limbs of the National Research Council instituted a program for suction sockets in August 1946 to determine its possibilities and limitations (8). As of September 1947 they fitted 52 cases. These subjects were selected in 10 localities in the United States in order to observe the effect of climatic conditions. Thirty-seven of the subjects have been wearing suction socket legs regularly for from 3 to 14 months. All are satisfied and have no intentions of returning to a pelvic belt-type leg. Nine subjects are still alternating between the suction socket leg and the conventional leg because of improper fitting, nervous disorders, or lack of cooperation. The remaining six subjects have been dropped from the program principally because of their inability to adjust to the suction socket for psychological reasons, and not because of failure of the suction socket.

At the amputation center, United States Naval Hospital, Mare Island, Vallejo, Calif., 100 suction sockets have been fitted to above-knee amputees since November 1946. Ten were failures, principally owing to the inability of patient to adjust himself to the suction sockets for psychological reasons and because of additional disabilities involving either the pelvis or the other leg. One of the ten patients who originally started with the suction socket and discarded it for the conventional type leg has returned to a suction socket and is now wearing one successfully. The patients selected included new amputees and those with multiple or complicating deformities in order to determine the limitations and contra-indications for the suction socket.

INDICATIONS

Generally, the suction socket can be profitably used by any thigh amputee who can successfully wear the conventional type prosthesis. A normal muscular stump, of good length, free from complications, can be most effectively fitted. Stump length is not an important factor. The Gritti-Stokes and supracondylar stumps can be successfully fitted with suction sockets. Extremely short stumps may also use the suction socket to advantage. The shortest stump fitted at

this center was 1 inch long. One of our cases, a bilateral above-knee amputee, had stumps so short that he had great difficulty walking because his stumps kept popping out of the sockets. This patient was fitted with suction sockets, in addition to utilizing the pelvic belt and joint, because additional stability was needed about the hips due to his short stumps. This combination solved this patient's difficulty and he was able to walk with greater skill and for longer distances. It has been suggested that suction sockets may be used to advantage in women amputees during pregnancy, since the conventional-type leg with the pelvic belt causes too much constriction about the abdomen. Most female amputees must discard their artificial limb during pregnancy. Age is not a factor, as children and elderly people can be successfully fitted with the suction socket. The oldest patient at this center is 78 years of age; and bilateral above-knee prostheses have been fitted to a 70-year-old patient.

CONTRA-INDICATIONS

Patients with associated injuries of the pelvis and opposite leg and injuries about the hip joint, with instability, do not use a suction socket to advantage. A case with increased capillary fragility of the stump is a definite contra-indication. Psychologically unstable amputees do not, as a rule, adjust to a suction socket because it requires greater cooperation from the patient, particularly during the first weeks of use. Dermatitis and active osteomyelitis are contra-indications. Scars about the stump, especially at the top of the thigh, may cause fitting difficulties and those with scars adhering to underlying bone should be fitted with caution. Large neuromas and sensitive bone spurs may cause trouble in any type of socket. Stumps with marked contractures are not suitable for suction sockets. Vascular diseases with impaired circulation in themselves are not contra-indicated and it is the impression that the alternating positive and negative pressure on the stump, which occurs in the suction socket, is beneficial and helpful in improving circulation. Actually the suction socket acts as a miniature "Pavex Boot" on the stump.

ADVANTAGES

The advantages of the suction socket over the conventional artificial leg are:

- (1) Greater freedom of movement in all directions, especially laterally.
- (2) Elimination of the pelvic belt and joint or shoulder harness, thus preventing break-down of these parts.
- (3) Less physical hindrance and less wear and tear of clothing.

(4) The prosthesis is lighter and the amputees state that the "dead weight" feeling is greatly reduced and that the prosthesis feels more like an integral part of the body.

(5) Friction between the skin and sides of the socket is eliminated.

(6) Elimination of stump sock.

(7) The stump muscles hypertrophy instead of atrophy, resulting in better control of the prosthesis.

(8) With the recommended shape and ischial seat, proper stump length is maintained and the subcutaneous fat roll, which occurs at the top of the socket with the conventional plug fit, is alleviated.

DISADVANTAGES

Most failures are due principally to the psychologically unstable patient. The suction socket requires a most accurate fit and alinement. The amputee must learn to place his stump in the socket correctly each time he wears the prosthesis. There is a period of several weeks of ischial discomfort, under the ischial tuberosity, which gradually disappears as the soft tissues and skin in the area adjust to weight bearing. The time required for an amputee to learn to walk is longer with a suction socket than with a conventional type leg, as observed when used on new amputees. Since the amputee uses his stump to control the limb, muscular development occurs. This requires further adjustment in the fitting of the socket by relief of stock in the socket sides in order to allow room for the increased size of the muscles. An initial period of shrinking often takes place because of the disappearance of edema following circulatory improvement. This may require the addition of a liner in the socket to maintain proper fit. Later, as the muscles of the stump develop, it is usually necessary to remove the liner. Excessive perspiration has not been a factor, but should it occur it can be controlled by the use of a two-way valve for constant exchange of air or by a package of silica gel in the bottom of the socket. Unsocial noises may occur while using the suction socket, but this is due either to improper fit, improperly seating the stump in the socket, or to a faulty valve.

ANATOMICAL RELATIONSHIPS AND SOCKET SHAPE

The conventional above-knee socket has been a plug type fit with some degree of gluteal weight bearing. The shape of the socket is fashioned according to the external shape of the stump. From an anatomical and physiological standpoint this has been improper. Amputees have been able to wear this type of socket and even suction sockets have been successfully fitted using the plug type fit. If an amputee will persist in wearing a prosthesis with a plug type socket

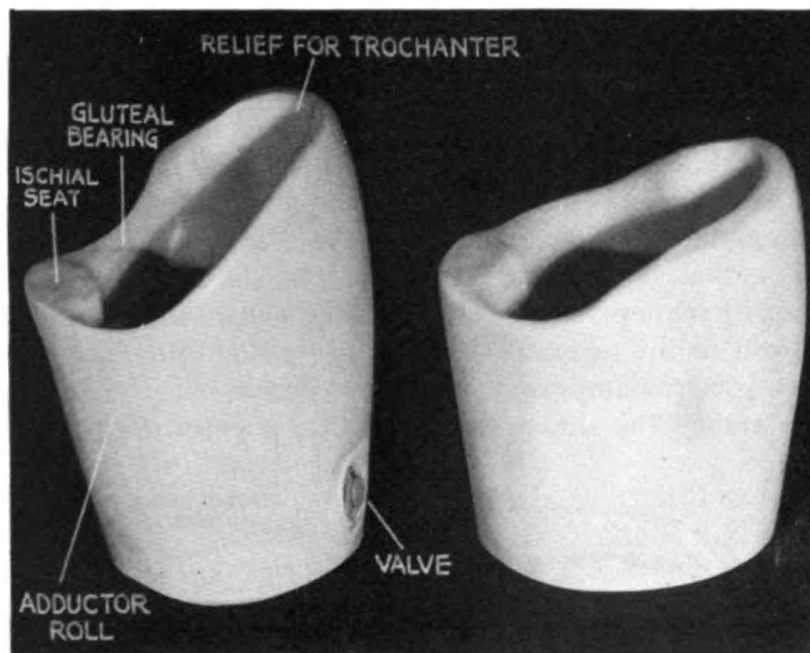


Figure 2.—Anterior view of suction socket.

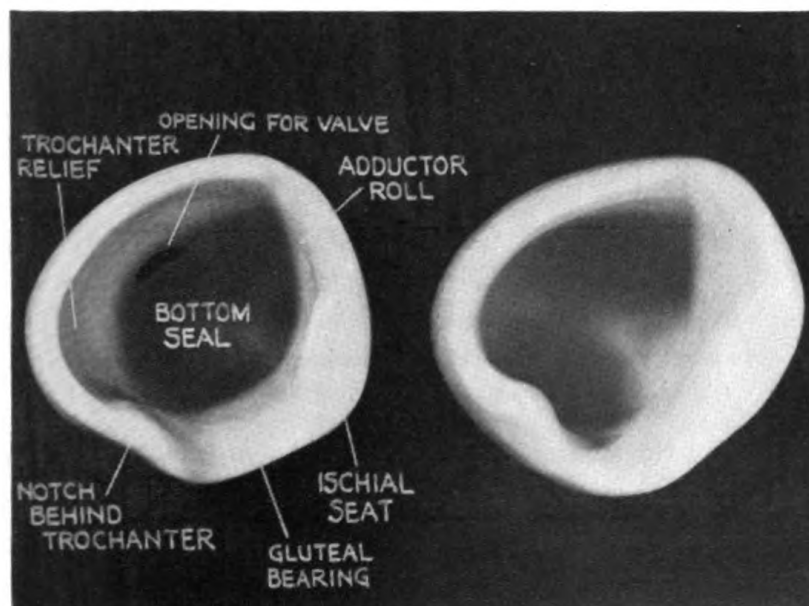


Figure 3.—Top view of suction socket.

his stump will gradually conform to the shape of the socket, even if it is made as a perfect cone. The soft tissues over the stump end are gradually stretched and a subcutaneous fat roll develops at the top of the socket rim. The major muscle groups gradually atrophy and the strength of the stump is reduced. The continuous pull on the

bone end of the stump, through the new attachment of muscles and scar is one cause of spur formation. If the amputee complains vehemently, the fitter will relieve the sides of the socket and allow room for some muscle hypertrophy. Additional room for muscle growth is made available when edema of the soft tissue is reduced. Some stumps will vary in volume as much as a 2-inch difference in diameter in 24 hours due to change in edema. These changes are most marked in newly amputated stumps. A patient who has worn a prosthesis for a number of years presents a stump which nature has kindly adapted to conform to the external shape of the socket and an experienced fitter can give the amputee a fairly comfortable fit. A common expression among the amputees is "the first 2 years are the hardest."

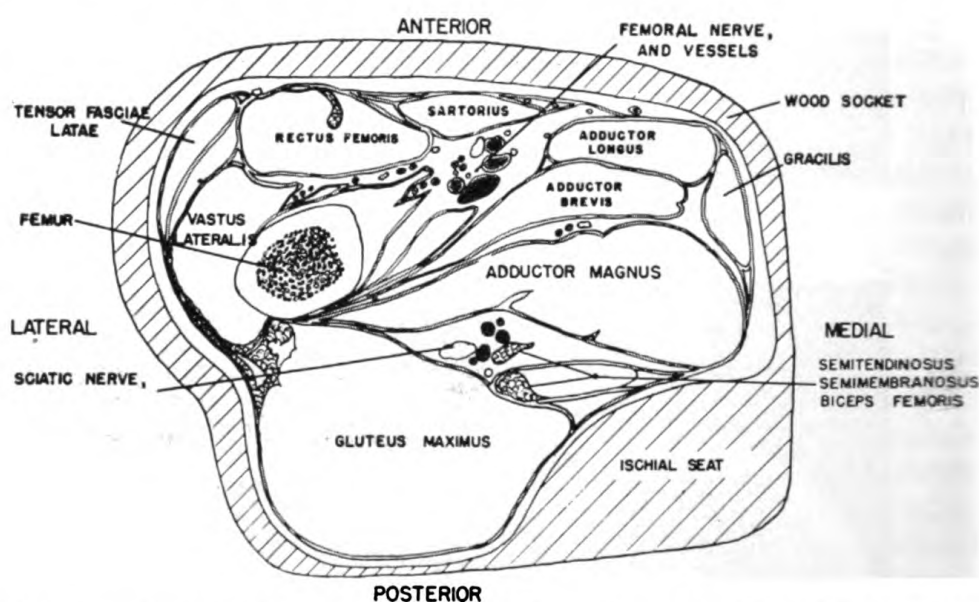


Figure 4.—Anatomy of cross-section of thigh in suction socket $\frac{1}{2}$ -inch below ischial tuberosity.

The shape of the suction socket is made to conform to the muscular pattern (figs. 2 and 3). A cross section of the human leg at the level below the ischial tuberosity (fig. 4) reveals that the major muscle groups, gluteal, adductors, and quadriceps, are in a somewhat quadrangular shape. Channels in the socket are provided for these major muscle groups. Compression of these muscles interferes with their function and further compress the major blood vessels and nerves. The notch behind the channel for the vastus lateralis and femur does cause an indentation, but this occurs in a fibrous area and is not harmful. It is necessary to help prevent rotation of the socket and maintain air seal while sitting. The ischial seat does compress the subcutaneous fat, which will tolerate compression. It provides a definite

shelf for the ischial tuberosity above it. The posterior line of the top of the socket follows the gluteal fold. A definite roll is provided for the gluteus maximus for partial weight bearing. This region is definitely lower than the ischial seat. The channel for the abductors is rolled outward and is slightly below the level of the ischial seat; thus allowing room for the ramus of the ischium which is generally lower than its tuberosity. The anterior line of the socket gradually slopes upward laterally and must be snug with definite undercut to allow for the subcutaneous fat but should not cause compression over the femoral triangle. Laterally the socket is held high but not over the trochanter. The inside shape of the socket through the middle and lower ends conforms to the cross section of the stump muscles which is generally oval in shape.

In the normal lower extremity while standing and during the weight-bearing phase of walking only slight muscular activity occurs. The body maintains the upright position and sustains its weight by the counter force exerted through the anatomical configuration of the bones. The major muscles act through the joints to accelerate and decelerate the various bones in their relative position of changes in the various planes in space. In the anterior-posterior plane the weight-bearing line of the body is through the spine, sacrum, and then across the pelvis through the acetabulum and head and neck of the femur and down the shaft through the knee to the great toe.

When standing on one leg balance can be maintained by tensing the abductors and tensor fascia lata in order to maintain a level pelvis. Balance can also be maintained by shifting the torso laterally, bringing the body weight-bearing line over the foot, or by shifting the pelvis laterally with the torso directly over the foot.

A thigh amputee, because of abductor loss and a short iliotibial band, can only maintain balance on his artificial leg by shifting his torso or pelvis laterally. This causes the typical gaits which occur when the amputee walks and is more pronounced in a short thigh stump.

Ischial weight bearing tends to alleviate abductor loss by shortening the lever bringing the lower weight-bearing line closer to the center body line.

The ischial tuberosity is slightly posterior to the hip joint, thus making for a tendency toward the development of lumbar lordosis but this tendency may be overcome by active use of the abdominal musculature.

The writers believe that all above knee sockets, with or without suction, should be fitted with ischial weight bearing, partial gluteal weight bearing, and channels for the major muscle groups.

PHYSIOLOGICAL RELATIONSHIP OF THE SUCTION SOCKET

The volume of air space in the bottom of the suction socket is not a critical factor. A volume of 6 to 8 cubic inches is generally permitted. This allows room for elongation of the stump which generally occurs after several months' wearing of the suction socket. The volume can be reduced to 1 or 2 cubic inches as in the case of a Gritti-Stokes type amputation. A sponge rubber pad in the bottom of the socket permits partial end bearing. The determining factor of the amount of negative and positive pressure is dependent upon the weight of the prosthesis, and the area of skin surface acted upon by the negative pressure. The excursion of the stump on weight bearing and the spring tension in the valve determines the changes in air volume and the degree of both positive and negative pressure. The formula in determining the negative pressure is:

$$\frac{\text{Weight of prosthesis}}{\text{Area of skin surface}} = \text{Pressure per square inch}$$

An additional factor which tends to add to the weight of the prosthesis is the momentum and inertia created by the swing-through phase of the prosthesis. Muscular action of the stump, especially in the gluteus and abductor groups, on contraction tend to push the prosthesis off the stump. These small factors added to the weight of the prosthesis are the total forces acting to pull the leg off the stump. Actually the force which maintains a suction socket leg on a stump is the push of surrounding atmospheric pressure.

The suction socket prosthesis is not without danger, and prolonged high negative pressure without introducing alternate positive pressure during the walking cycle can cause harm. Although an amputee's

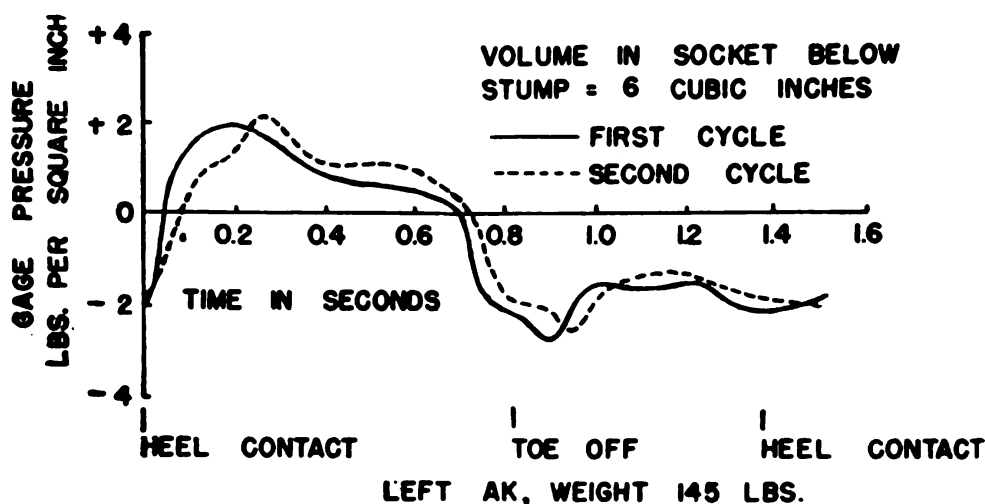


Figure 5.—Pressure variation inside a suction socket during level walking.

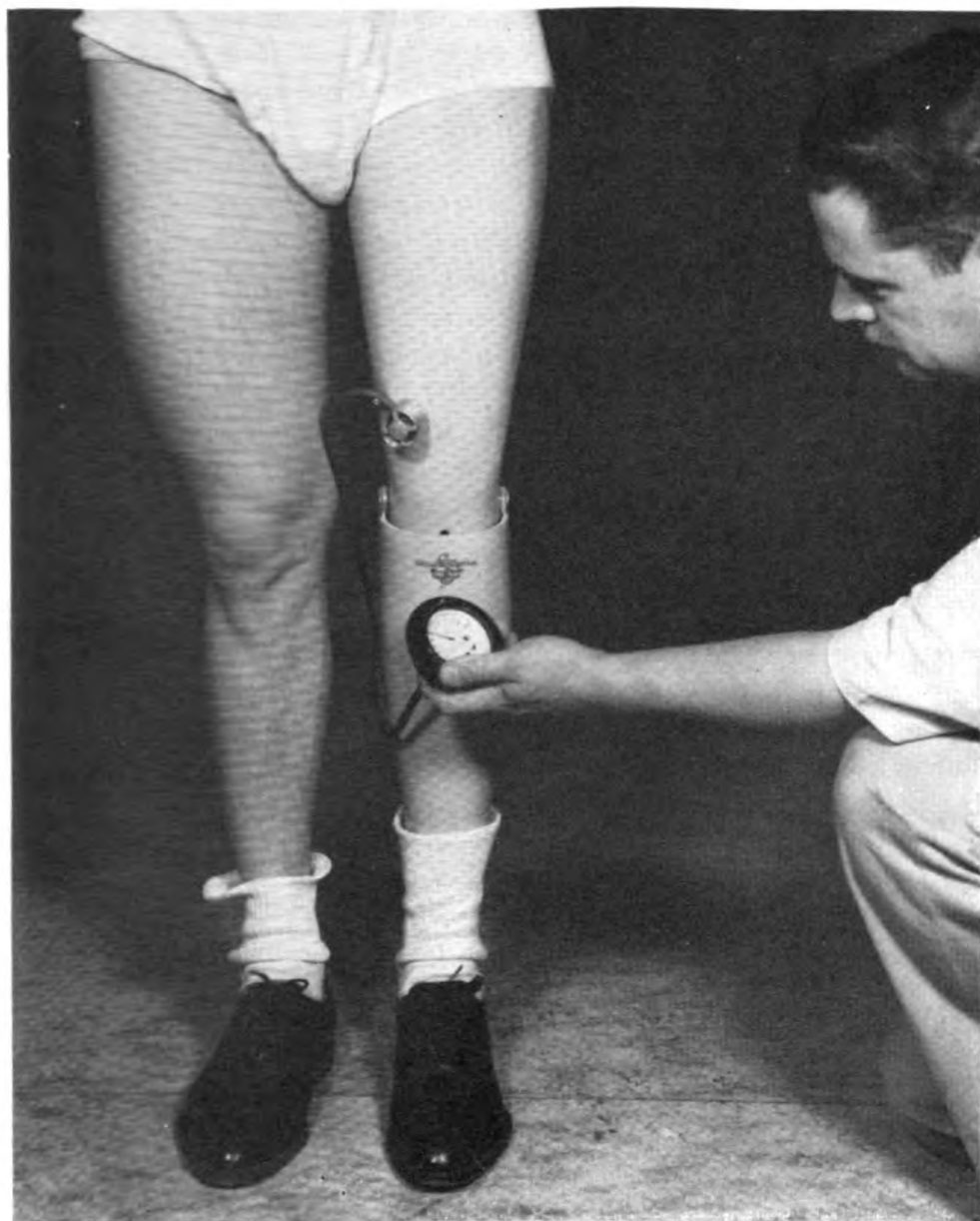


Figure 6.—Pressure gage attached to prosthesis.

stump can stand up to 4 pounds per square inch negative pressure for a second at a time, the average negative pressure should not be higher than $\frac{3}{4}$ pound per square inch (fig. 5). Should the pressures remain near the critical points, edema, congestion with discoloration of the tissues, petechiae, and even actual hemorrhage through the skin can occur and an anoxemia of the tissues with gangrene may result. The second important factor which may lead to trouble is constriction of pressure over the venous system especially at the femoral triangle. Even with the normal allowable negative pressures but with constriction on

venous return, edema, discoloration, and petechiae and anoxemia of the tissues can occur. The surgeon and fitter can check the fluctuation of pressure that is present in the air space by use of the pressure gage (fig. 6). It is reiterated that accuracy of fit is vitally important. A stump with impaired circulation such as is present in Buerger's disease, arteriosclerosis, traumatic injuries to the circulatory tree, or over areas of scar tissue, is vulnerable and will not tolerate even minor errors in fit and pressures. This type of stump is the very one which will be benefited by the suction socket, because the alternating positive and negative pressure improves the circulation.

From a physiological standpoint, any obstruction to venous return increases intracapillary pressure and upsets the normal balance of the resultant osmotic pressure which exists in the tissues and blocks the return of the tissue fluid to the capillaries, thereby causing edema and anoxemia. The suction socket is contra-indicated in a case with increased capillary fragility.

Constant high reduction of tissue tension produced by constant high negative pressure on the skin also upsets the balance and leads to edema and anoxemia of the tissues.

The normal amount of resultant osmotic pressure on the arterial side of the capillary is about 17 mm. of mercury out into the tissues. On the venous side the resultant osmotic pressure is about 13 mm. back into the capillaries.

Blockage in the lymphatic drainage of the stump also will unbalance the osmotic capillary mechanism and will lead to edema of the stump. This is a minor factor and before lymphatic blockage occurs venous obstruction would be present.

MATERIAL

The types of material used in the manufacture of the suction socket are unimportant. Wood has been the material most commonly used throughout the industry, with basswood and English willow being the predominant types. It is most important that the wood used be thoroughly cured and completely free from knots. Wood is also used because of the ease in making alterations and adjustments to the socket which become necessary as the stump changes in contour and size. The bottom seal must be cross-grained to prevent seepage of air which would break the vacuum. All glue used should be waterproof so the seal would not break with perspiration of the stump. Plastics and aluminum have been successfully used for suction sockets.

MEASUREMENTS

Measurements of the stump and remaining leg are taken in the conventional manner. Patterns are used only for roughing out the

socket and the actual fitting of the socket must be made by trial on the patient. Contours of the stump muscle patterns are found by the use of a lead tape (fig. 7). The shape of the lead tape is traced on the



Figure 7.—Lead tape molded around stump for determining muscle pattern.

top of the wood block and is used as the rough guide by the fitter, to make the preliminary pulling of the socket. When shaping the lower portion of the socket the general contours of the stump are followed.

TIGHTNESS OF FIT

Tightness of fit is critical and is determined by the force required to pull the stockinette through the socket. The tightness of fit is again checked by having the amputee contract the muscles of his stump, which will then require considerable force to pull the socket off the stump. On relaxation of the muscles of the stump, the socket should remain on the stump but the fitter should be able to pull it off with slight effort.



Figure 8.—Lateral plumb line drawn on socket through balance point.

ALINEMENT

The alinement of the suction socket limb is also critical. The principle method of alining an artificial limb used throughout the industry is by means of the experienced eye and wedging. This is satisfactory but is entirely dependent on the experience and skill of the fitter. A simple method of alinement successfully used at this center utilizes a triangular bar placed on an adjustable fitting stool, with the bar in the antero-posterior plane. The amputee stands in the socket on the

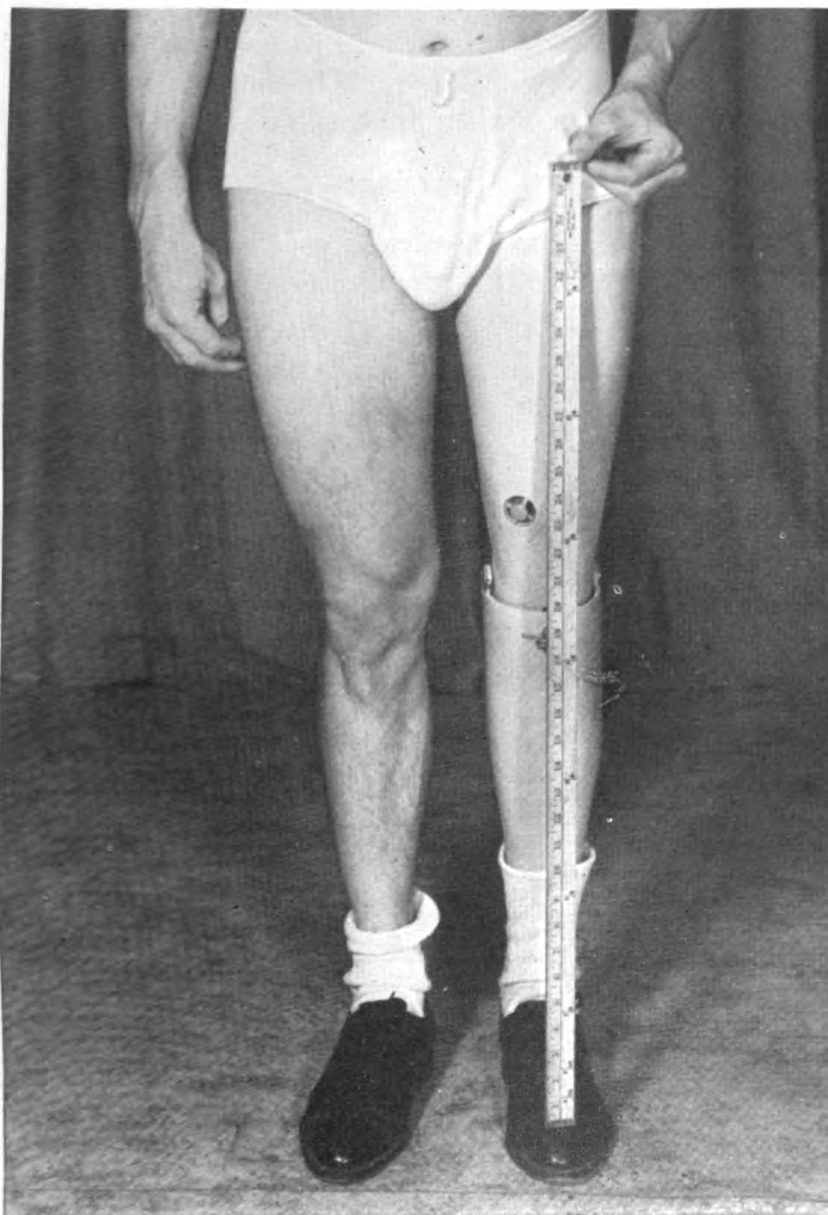


Figure 9.—Plumb line on socket projects through middle of knee and great toe.

knife edge of the bar with weight bearing borne equally in his socket and on the good leg. By moving the bar medially and laterally he can tell where it is most comfortable while bearing on the knife edge. By means of a square level rule a line is then drawn on the outside of the socket (fig. 8). A plumb line along the line drawn on the socket should then drop through a plane in the center of the knee, down the shin to the great toe (fig. 9). A lateral line is drawn on the socket in a similar manner, the projection of this line should fall anterior to the knee axis, and slightly posterior to the axis of the ankle. A degree of bow-leg or knock-knee is built into the limb only when it is necessary to match the opposite leg. It may be necessary to aline the leg with a degree of inset or outset or angle in the antero-posterior plane to provide for contractures when present in a stump.

VALVES

A simple expulsion type of valve is usually used (fig. 10). The valve is placed on the anterior-medial aspect of the socket. It must be at the level of the air space below the end of the stump.

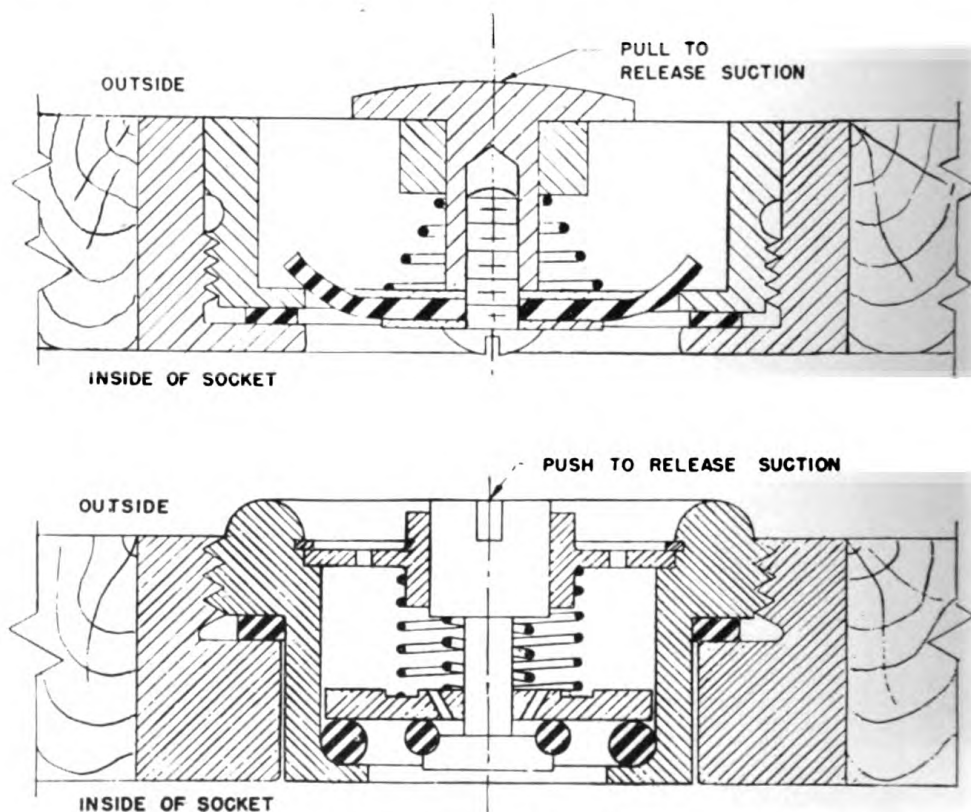


Figure 10.—Typical automatic expulsion valves for suction sockets.

PUTTING ON LIMB

Contrary to the method of putting on a conventional type leg, the suction-socket prosthesis is toed in slightly, while pulling the stump into the socket. By pulling the stockinette through the valve opening the stump is firmly fitted in the socket. The valve is then replaced and the limb is ready for use (figs. 11 and 12).



Figure 11.—Stockinette on stump.



Figure 12.—Removal of stockinette.

HYGIENE OF THE STUMP

It is recommended that the stump be bathed at least once a day with soap and water. The socket also should be thoroughly cleaned daily. An amputee should take as good care of the stump, from a hygienic standpoint, as he would his face.

INSIDE FINISH

The inside of the socket should be smooth and finished with compounds similar to lacquer or cellulose acetate.

SUCTION SOCKETS FOR OTHER TYPES OF AMPUTATIONS

Suction sockets have been successfully fitted at this center for below-knee, above-elbow, and below-elbow amputees. Above-elbow suction sockets are readily fitted and can suspend weights up to 160 pounds. The problem in the below-elbow prosthesis is more difficult, but by using a soft liner with a semirigid socket and a ring of sponge rubber around the rim of the socket (for better air seal) sufficient vacuum can be maintained. We believe that great promise is possible for below-knee suction sockets but it requires a radical change in design of the shape of the socket in order to be completely successful.

CONCLUSIONS

1. Above-knee suction sockets can be successfully fitted in about 90 percent of above-knee amputees.
2. Suction sockets are indicated in stumps with impaired circulation because of the beneficial effects of the alternating positive and negative pressures, with resulting improvement in stump circulation.
3. In patients with extremely short stumps a suction socket provides the very necessary method of holding the stump in the socket.

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Osteosynthesis by Means of Spring Power

DR. RICHARD MAATZ¹

IT IS known that fractures will unite most certainly and most rapidly when set under pressure or, to speak more precisely, when steady and balanced pressure and traction are applied to the bone wounds. Consequently the possibility of applying mechanical pressure to the fragments will be of great advantage in those cases in which, owing to one reason or another, the natural resources of the body, such as the muscles, fail to guarantee the necessary amount of pressure. Among the various methods of osteosynthesis now used there is none which can impart such permanent artificial pressure during the period of repair so as to fuse the fragments into mechanical and functional unit. In view of the importance of permanent pressure acting upon the surface of bone fragments the author took recourse to spring power in order to bring about this osteosynthesis. It was first applied in the beginning of 1944 and in cooperation with the firm of Dr. Pohl of Kiel it now has been developed into a special method of orthopedic operation.

The first example of osteosynthesis by spring power is the "ligature spring" (fig. 1). It is a wire curled at two points into a screw spring.

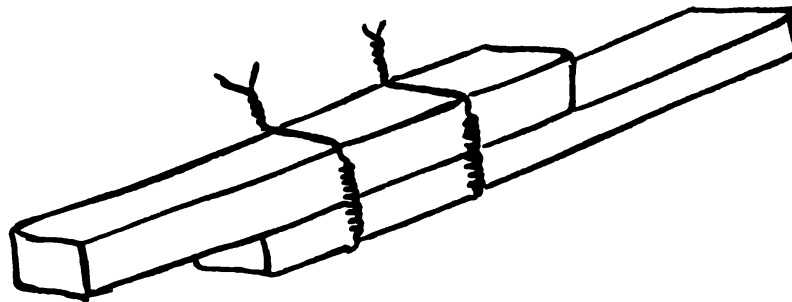


Figure 1.—*Ligature spring.*

Its insertion is quite different from a simple wire ligature. Since bone is practically noncompressible, the difference in the amount of force required to give optimal tension or fracture of the wire used as ligature is extremely slight, as will be affirmed by every operator.

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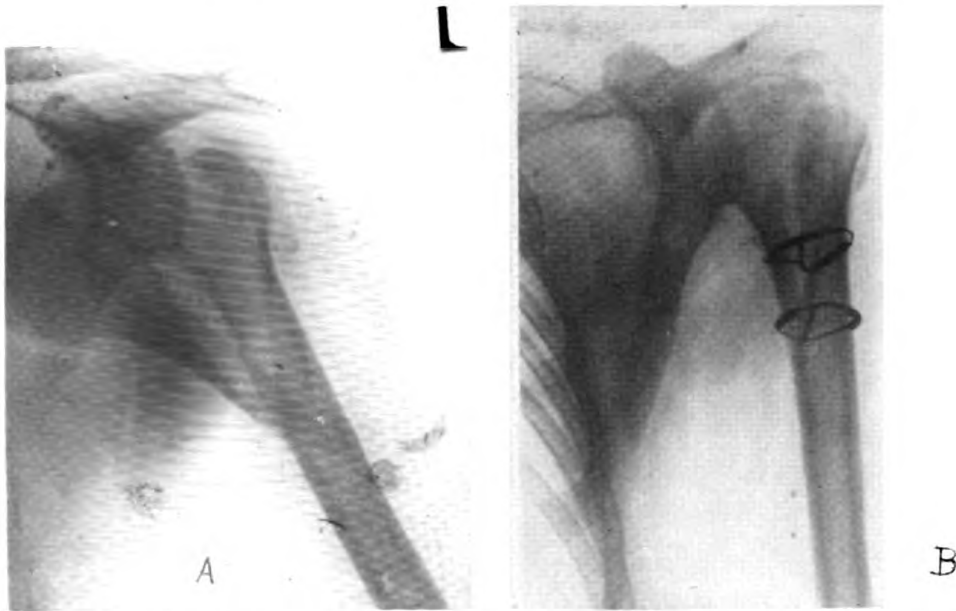


Figure 2.—(A) Fracture and luxation of the humerus. (B) Condition 4 weeks after operative treatment with ligature spring. No plaster dressing.

Further, the process of bone resorption, even if slight, will soon overcome the firmness of the simple wire ligature. When using a ligature spring we can do without a plaster dressing in many cases; the elastic power of the spring ligature will present fractures of bone or wire, and so prudent use of the arm may be had (fig. 2).

As to bone grafting, it is possible by means of the spring to press the graft into its osseous bed, thus fusing both into functional unity. Even in anatomical locations unfavorable to bone grafting, for instance, the spine, the writer hopes that the new method will improve our operative results (figs. 3 and 4).

The second example is the "spongiosa spring," so-called after the spongy bone it is to unite. It is a screw-shaped tension spring, the front part of which ends in a wire screw (the "anchor") while at the

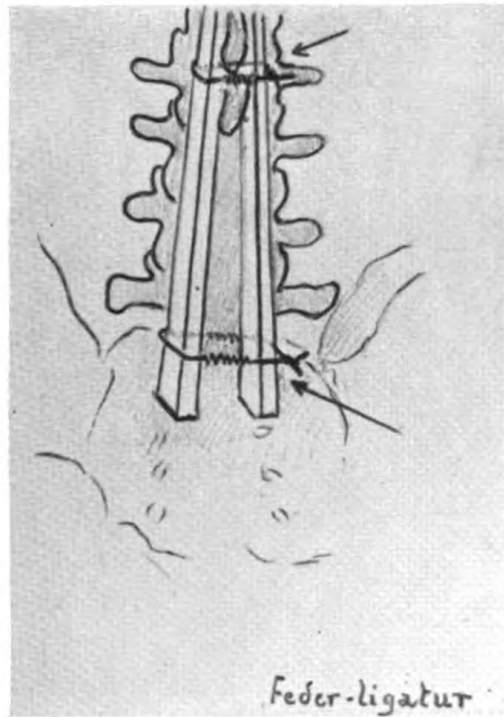


Figure 3.—Bone grafting of the spine with ligature spring.

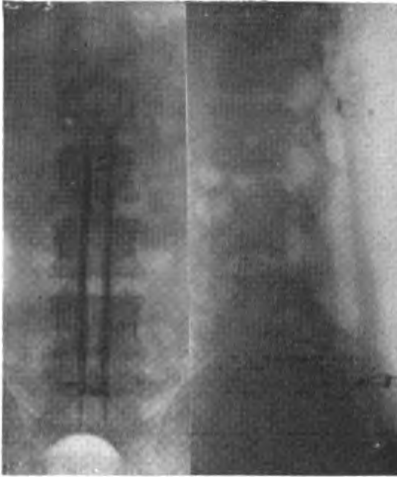


Figure 4.—Bone grafting from the tibia to the spine in order to render the lumbar spine stiff because of static insufficiency after laminectomy for operation on lumbar disk herniation.

other end the wire is curled into a spiral spring shaped like a low cone. The "anchor" protrudes into the spongiosa of the fragment farthest from the area of operation, thus stretching that portion of the spring lying in a drilled channel of adequate width in the other fragment (next to the area of operation), while the "head" shaped like a spiral spring remains on the surface of the bone and fits it well by reason of its shape. A favorable distribution of pressure on the area of contact is effected by the elastic deformation from the cone to the plane (fig. 5).

The spongiosa spring is inserted with the aid of a conical four-cornered key fitting into corresponding small notches in the spring. The spongiosa spring permits the close apposition of bone fragments which, owing to their softness, are known to

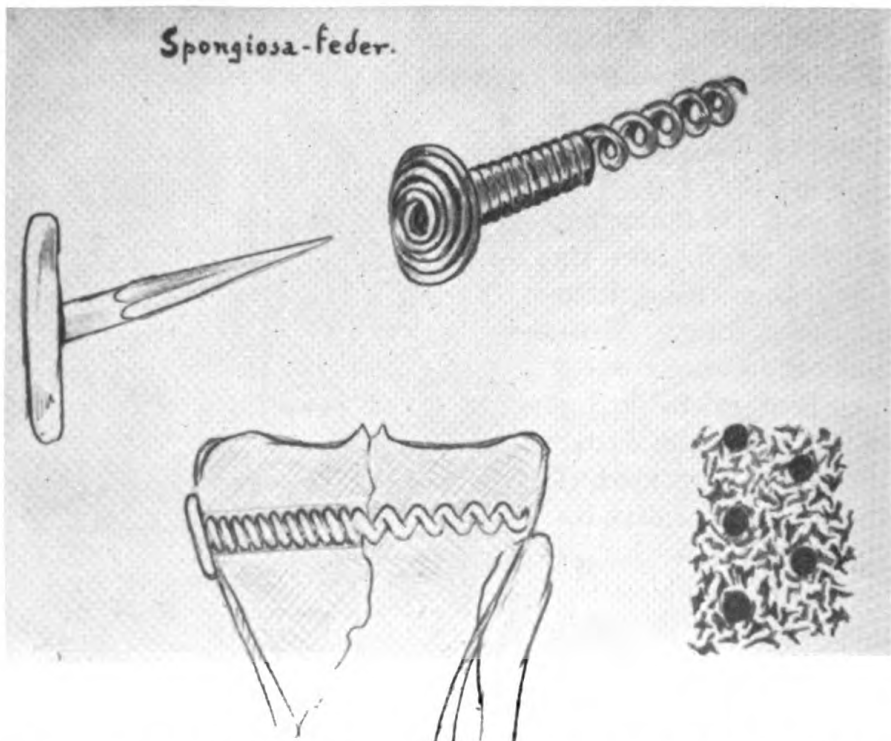


Figure 5.—Spongiosa spring. Section through the screw anchor showing the broad area on which the force of traction is distributed, thus explaining the firmness of this method of anchoring.

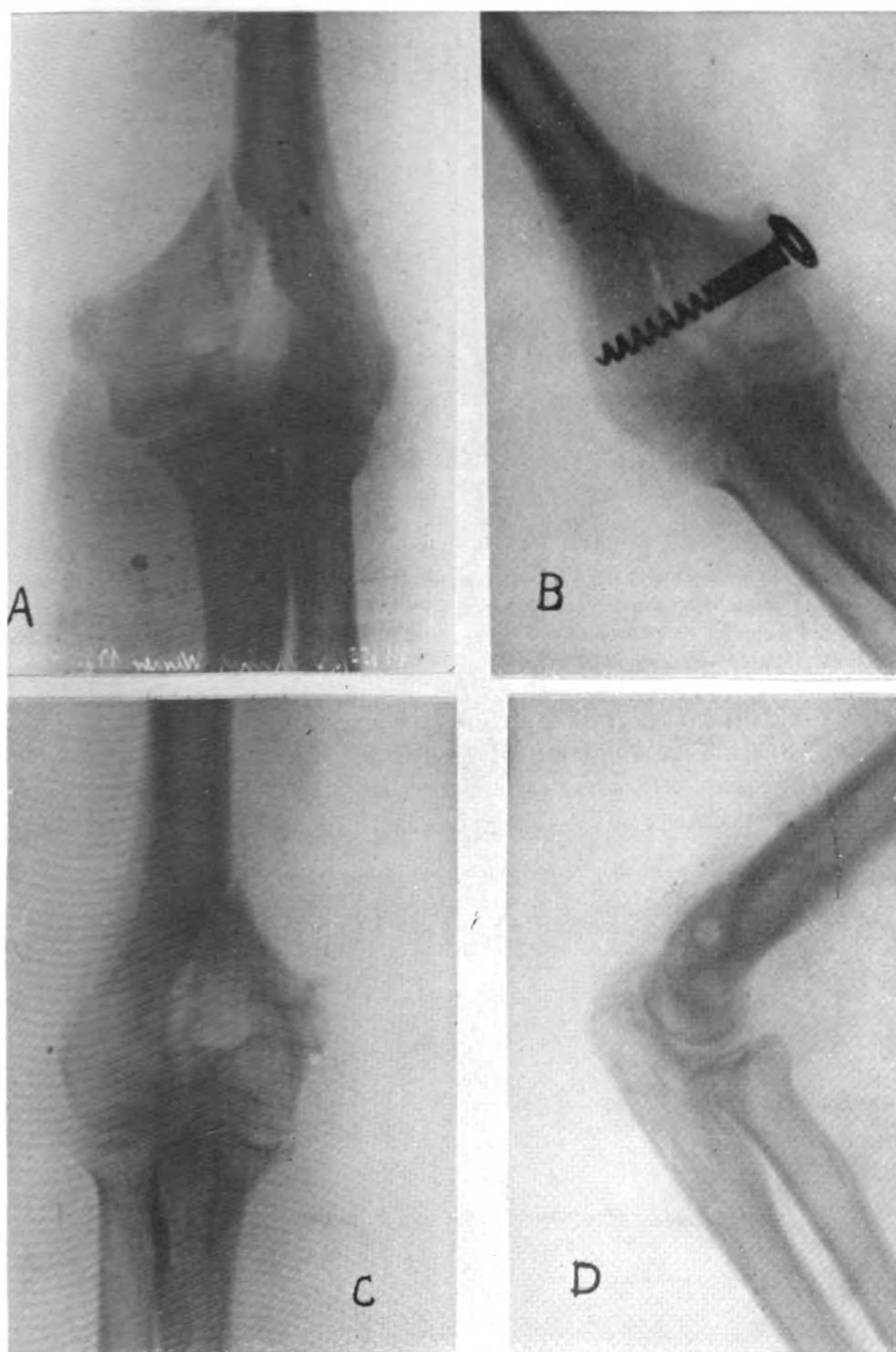


Figure 6.—(A) Fracture of the condyles at the elbow joint. (B) After treatment with spongiosa spring. (C and D) Condition after removal of spongiosa spring, 6 weeks postoperatively.

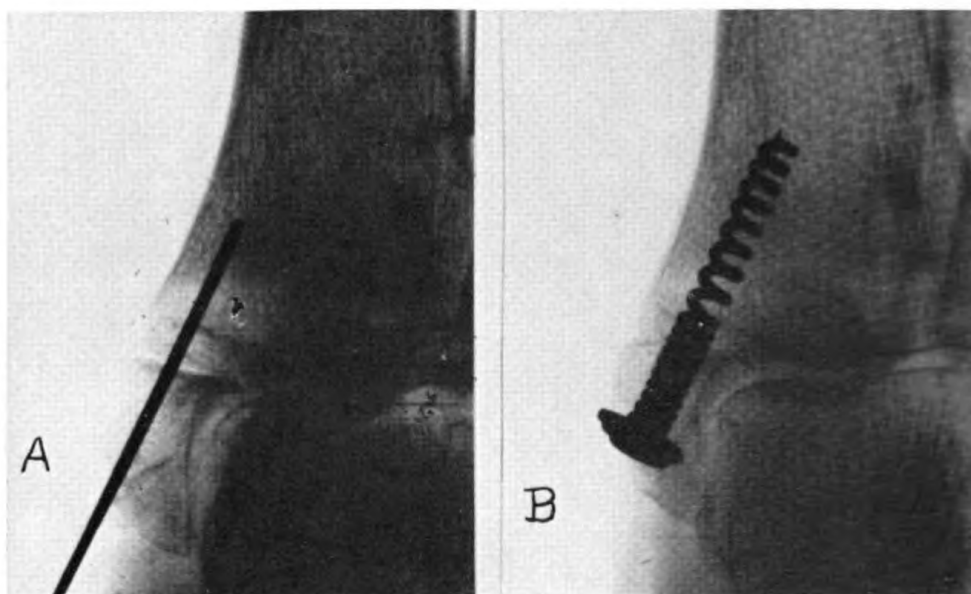


Figure 7.—Pseudarthrosis of the inner ankle. (A) Shows the gap of the pseudarthrosis intra operationem during the freshening by drilling. (B) The defect bridged over by osseous tissue 8 weeks postoperatively with the spring still in place. (Plaster dressing is necessary.)

cause difficulties and failure in operative treatment. Exact and reliable reduction particularly of this kind of fragment during the period of repair, is of great importance, since these are generally part of a joint. Another advantage arises from the possibility of keeping



Figure 8.—Fracture of olecranon treated with spongiosa spring. No plaster dressing. Able to do easy work in the household after 14 days.

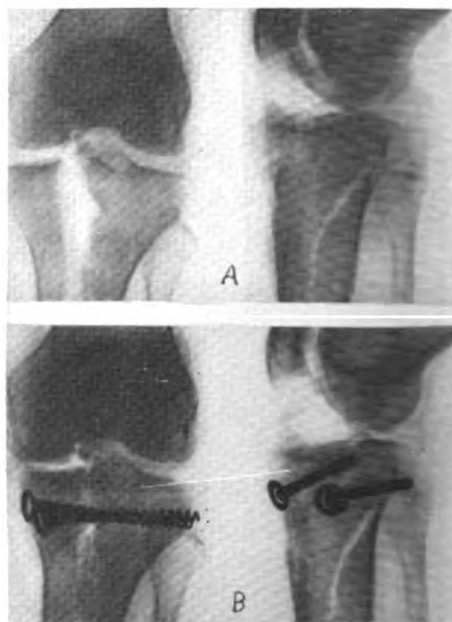


Figure 9.—Action of the spongiosa spring and its location in fracture of the head of the tibia.

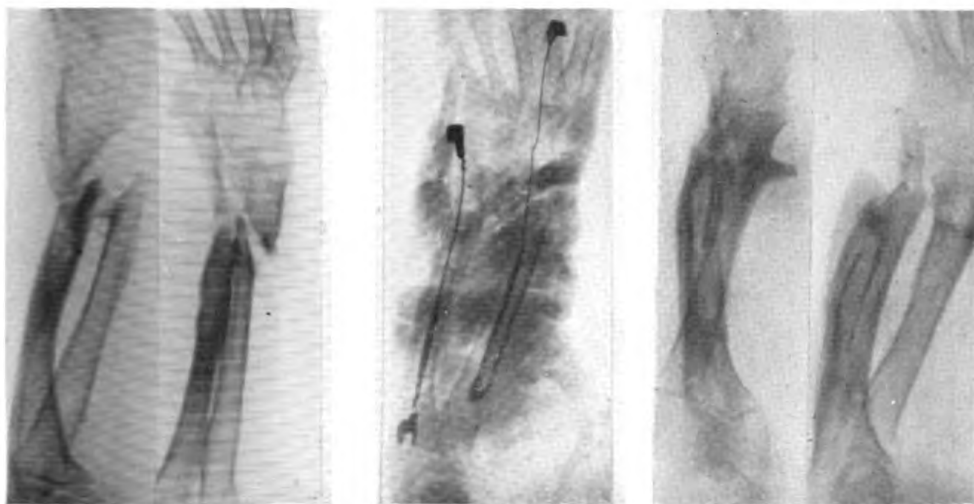


Figure 10.—(A) Pseudarthrosis of the forearm near the wrist with severe dystrophy of the hand after compound fracture of the forearm. (B) During treatment with bone cavity spring and plaster dressing. (C) Osseous union in spite of persisting suppuration until removal of the spring after 4 months.

the area of operation away from the fracture site, which already has been proved of value in nailing the neck of the femur and in the marrow nailing of Küntcher. Figures 6, 7, 8, and 9 show clinical examples.

The last example is the "bone cavity spring," which has proved efficient in treating pseudarthroses of the humerus and ulna, in the osteotomies, as well as in the artificial arthrodesis. The possibilities of this spring, even in severely suppurating cases, is shown by the roentgenograms in figure 10. The patient was admitted for amputation and left the hospital with a hand able to grip a hammer.



Figure 11.—Shortening the ulna because of post-traumatic central luxation of the ulna. Fixation by means of bone cavity spring. Additional plaster dressing.

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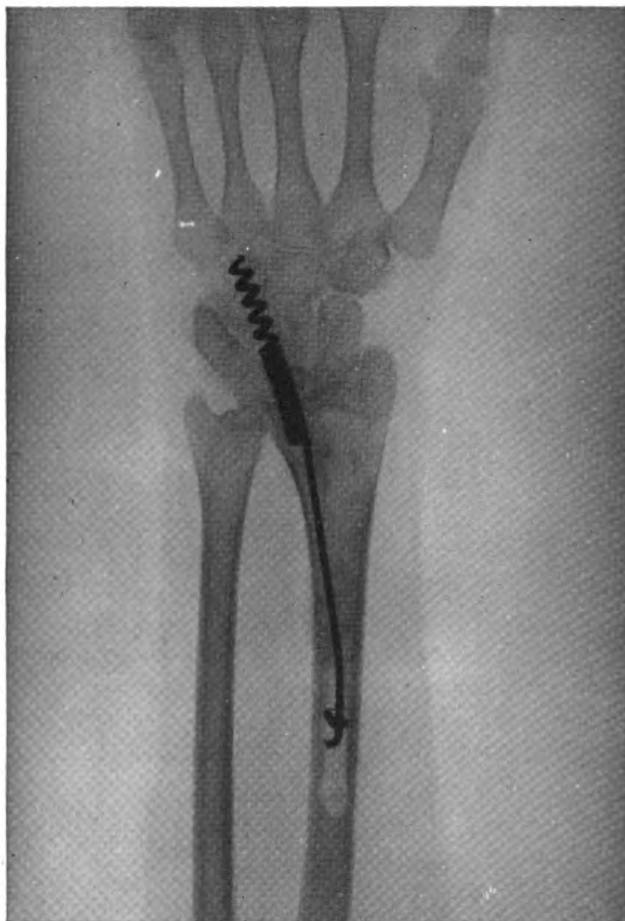


Figure 16.—Arthrodesis of the wrist by spring, because of paralytic contracture. Osseous union between radius and os naviculare after 8 weeks.

In the artificial arthrodesis the spring works reliably. A conservative freshening of the joint surfaces will be sufficient. The spongiosa anchor is drilled into the one joint surface, which generally will be the socket, and the spring is stretched by an easily working tension apparatus while a "pinching rider" (a small piece of metal) automatically prevents the wire from gliding back (fig. 13).

For example, see the roentgenograms: a paralytic flail joint in a 14-year-old girl (fig. 14). The implantation of the trochanter because of necrosis of the head of the femur after intracapsular fracture of the neck (fig. 15). The arthrodesis of the radioavicular joint in a complicated case of contracture of the wrist (fig. 16).

The above résumé on the application of the spring in osteosynthesis is in no way complete. A great number of possibilities still remain. Two years ago the author's honored old master, Geh. Rat. Anschütz, drew attention to the fact that perhaps the spring might be effective

in the treatment of intracapsular fracture of the neck of the femur. Considering our experiences with the spring up to now, it is felt justified to expect good results from its application even in this particularly difficult situation.



Bankart Operation For Recurrent Dislocation of the Shoulder

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IN THE Navy, recurrent dislocation of the shoulder offers a problem because of the frequency with which it is encountered. the difficulty in treatment and the time required in returning a patient to duty who is afflicted with this condition.

It is the purpose of this article to call attention to the technical difficulties encountered in the Bankart operation for repair of this condition. Further, an attempt is made to take up each of these technical difficulties step by step and discuss methods and improvements in dealing with these problems.

Since Bankart's original description of his operation in 1938 (1), it is becoming the accepted procedure in the treatment of recurrent dislocation of the shoulder. The Nicola repair and the Henderson fascial sling method are the other methods frequently used. It is stressed that the Bankart procedure is the only one which attempts to reconstruct the basic pathological lesion. The author wishes to further emphasize the fact that the other methods mentioned may be sufficient for a patient returning to a sedentary type of occupation; but in the armed forces the patient is frequently returned to tasks requiring arduous physical labor and Bankart's procedure is less prone to recurrence than the others. Watson-Jones (5) reports a series of 34 Bankart procedures with no recurrences, many of the patients returning to hard physical labor or indulging in sports such as football; 5 recurrences in a series of 18 Nicolas; and 1 recurrence in 1 fascial sling method. In a series of 12 cases in this hospital we have encountered 2 cases which recurred after Nicola's procedure and which were repaired by Bankart's method.

OPERATIVE TECHNIQUE

The best incision is one that begins one-half inch below the outer border of the clavicle, extends medially parallel to the clavicle to a point directly over the coracoid process. The incision then curves inferiorly along the bicipital groove for 5 inches. The deltoid and pectoralis major muscles are separated by blunt dissection. In this

groove is found the large cephalic vein, and this should be retracted medially with the pectoralis major muscle if possible. Sometimes this is difficult because of numerous venous tributaries and inadequate dissection of the vein, in which case it may be ligated inferiorly.

To obtain the best exposure of the shoulder, the deltoid muscle is cut one-half inch from the clavicle and removed from its outer third.

The dissection then proceeds to the coracoid process, and overlying this process near its tip is the acromial branch of the thoraco-acromial artery which should be ligated medial to the coracoid. For proper removal of the coracoid process a detailed knowledge of this bony structure and its ligamentous attachments is necessary.

The coracoid process, as it projects, extends somewhat laterally overlying the upper part of the glenoid. To its tip the pectoralis minor, coraco-brachialis and short head of the biceps muscles are attached. On the lateral part of the tip and extending on to the process is the broad coraco-acromial ligament and at the lateral tip by a small attachment is the coraco-humeral ligaments. The coraco-acromial ligament is cut close to the body of the coracoid process one-half inch from the tip and a curved aneurysm needle is used to pull a Gigli saw beneath the process, which is then cut through. The process may be drilled lengthwise from its tip, if desired, so that the tip may be replaced later with a single 1-inch vitallium screw. Next the coraco-acromial ligament and coraco-humeral ligament must be cut away from the tip which is then retracted inferiorly and medialward with its attached muscles.

The subscapularis muscle belly and tendon is thus exposed and the proper dissection of this tendon from the capsule of the shoulder joint is made and has been described by Cave and Rowe (3) as one of the most difficult steps in the operation. This is best done by completely dissecting free the upper and lower borders of the tendon near its attachment to the lesser tubercle of the humerus. A venous plexus which bleeds quite freely is encountered at the lower border of the tendon, and this should be controlled by ligature. A blunt, curved clamp is then used very carefully to dissect the tendon from the joint capsule. Working first from the superior part of the tendon, then from the inferior border, the tendon is freed from the capsule and cut through one-half inch from its attachment to the lesser tubercle of the humerus. A heavy silk suture is put in the medial part of the tendon mattress style, and the tendon allowed to retract medially.

A detailed discussion of the pathologic findings will not be described here, but the lesion usually described is an avulsion either partial or complete of the glenoid fibro-cartilaginous disk. An associated rent in the anterior capsule may or may not be present. In this series of cases, an avulsed fibro-disk was found in all the cases.

A definite rent in the capsule was found in three cases, and in two, a small chip of bone was found to be detached from the bony glenoid rim.

An incision 1 to 2 inches in length is made in the capsule parallel to the glenoid margin and one-fourth to one-half inch away from the glenoid margin. To clarify the discussion, the portion of the capsule attached to the glenoid margin will be referred to as "proximal capsule" and the free-cut margin of capsule will be referred to as "distal capsule."

The avulsed fibro-disk is dissected free and cut away. Care must be used in dissection of the disk from the capsule. Eyre-Brook, after dissecting 21 shoulders, described the capsule as attached to the lip of the glenoid and not to the neck of the scapula. The capsule, it is true, does not attach to the neck of the scapula, but it does attach to the glenoid a little beyond the fibro-disk. This point is of importance, because the next step in the operative procedure is removal of a shaving of bone from the glenoid margin with an osteotome, after first abducting the arm and pushing the humerus down to adequately expose the glenoid.

After excising the shaving of bone from the glenoid, and if the proximal attachment of the capsule has been properly preserved, a good flat shelf on the glenoid labrum is produced.

Bankart (1) originally described drilling four small holes with a right-angled drill from the glenoid labrum into the glenoid cavity, fixing the free margin of the distal capsule to the glenoid labrum with two heavy mattress silk sutures, and plicating the proximally attached capsule into the capsule.

Because of the difficulty in accomplishing this step many articles have been published describing various instruments to aid in this procedure. Right-angle dental drills, and special curved awls have been used to drill the holes. Also the drilling of the holes has been omitted and various methods to fix the capsule to the glenoid labrum have been used, such as small plates, screws, and staples.

It appears that fixation of the capsule to the glenoid labrum by a small vitallium plate and two screws offers the strongest repair and saves much time in the procedure. This eliminates the difficulties involved in drilling the holes. The proximal capsule is brought over the glenoid labrum and beneath the plate. The capsule is then basted down to the labrum with the plate and the rent in the capsule sutured.

An alternate method is to bring the free margin of the distal capsule over to the glenoid labrum, where it is fixed to the labrum with the plate. The proximal capsule is then brought over the plate and plicated into the capsule with heavy silk sutures. The humerus must be held in adduction and internal rotation when the capsule is fixed.

One disadvantage of this method is that pressure necrosis of the capsule from the plate may result. However, the writer has not encountered this.

The subscapularis tendon is reapproximated to its attachment with heavy silk sutures. The coracoid process is then accurately replaced by suture or by fixation with a 1-inch vitallium screw (fig. 1). The screw maintains a more accurate reduction. The deltoid clavicular attachment is then accurately reapproximated with silk sutures.

Postoperatively the patient is immobilized in a Velpeau dressing for a period of 3 weeks. A sling is then allowed for 1 week during which time physical therapy consisting of infrared, diathermy, and massage is administered to the shoulder, but no exercises are prescribed.



Figure 1.

At the end of the week, the sling is removed and circumduction, stretching, and reaching exercises are given for a period of 2 weeks or until a full range of motion in the shoulder is attained. The patient is returned to duty in 8 to 10 weeks.

CASE REPORTS

Case 1.—This 19-year-old seaman first class first injured his right shoulder 1 year previous to admission, when, attempting to pull a landing boat to a pier, he received a violent wrench of the shoulder suffering a subglenoid dislocation.

The dislocation was reduced without anesthesia. Since then the shoulder has dislocated 20 times. Extending the arm over the head usually dislocated the shoulder.

The last dislocation occurred 1½ months before admission when a general anesthetic was required for reduction. The physical examination was negative except for minimal tenderness about the shoulder joint and a partial dislocation of the right sterno clavicular joint.

Roentgenograms of the shoulder were negative. The shoulder was explored in the routine manner, and the glenoid fibro-disk found to be detached. This was carefully excised, and after recovering a small shaving of bone from the glenoid labrum, the free margin of the distal capsule was brought over and fixed to the glenoid labrum with No. 2 mattress silk sutures. The proximal capsule was then brought over and plicated into the capsule with No. 2 silk sutures. The subscapularis tendon was accurately reapproximated. The coracoid process was drilled and fixed with a single heavy silk suture. The deltoid muscle was reapproximated.

The patient was immobilized in a Velpeau dressing for 3 weeks. He was then allowed an arm sling for 2 weeks during which time physical therapy, as described, was given. At the end of this time, circumduction, stretching, and reaching exercises were given for 2 weeks. Following this the patient had a good range of motion in the shoulder and was asymptomatic.

Case 2.—A 19-year-old seaman second class suffered a subglenoid dislocation of the left shoulder in June 1947. A large box fell from a hoist, striking him on the back of the left shoulder while he was loading supplies in a ship's storeroom. The patient reduced the dislocation himself.

One month later, while reaching for a base runner in a baseball game, he again dislocated the shoulder. Again he reduced the shoulder himself. Since that time the shoulder has dislocated 25 times. Simply hyperextending the arm over the head sufficed to dislocate it. The patient usually reduced the dislocation by pushing upward into the axilla with the right hand while "rolling" the left arm down.

The general physical examination was negative except for the fact that the patient could demonstrate the dislocation by forcefully hyperextending the arm over the head. The head of the humerus could be palpated anterior and inferior to the glenoid and could be easily reduced. Roentgenograms of the shoulder were negative.

The shoulder was exposed at operation in the usual manner. A 4 cm. rent was found in the anterior portion of the capsule. The glenoid fibro-cartilage was detached, and two small chips of bone were found detached from the bony glenoid rim and lying free in the glenoid cavity.

The free margin of the "distal" capsule was brought over and fixed to the glenoid labrum, which was first shaved down with an osteotome, and fixed with

a two-screw plate. The rent in the capsule was sutured, and the proximal capsule was brought over the plate and plicated into the capsule with No. 2 silk sutures. The coracoid process was drilled and fixed with a single vitallium screw.

The usual postoperative treatment was carried out—namely, immobilization in a Velpeau dressing for 3 weeks, 2 weeks in a sling with physical therapy, followed by 2 weeks of circumduction, stretching, and reaching exercises. At the end of this time the patient had a satisfactory range of motion in the shoulder.

Case 3.—A 25-year-old electrician's mate first class dislocated his left shoulder while playing in a basketball game in 1943. At that time the head of the humerus was described as being in a subglenoid position. Reduction was accomplished without anesthesia.

The following year he again dislocated the same shoulder when hyperextending the arm over the head. Following this dislocation, a Nicola procedure was done on the shoulder following which no further dislocation occurred for 2 years.

Eight months before admission to this hospital, he again suffered a dislocation of the shoulder, requiring a general anesthetic for reduction. He has since dislocated the shoulder four times, once while swimming, that required a general anesthetic for reduction.

Physical examination disclosed a previous Nicola operative scar and slight atrophy of the left deltoid muscle. There was a good range of motion in the shoulder.

At operation, an old 3-cm. rent was found in the interior capsule, and the glenoid fibro-disk was detached. After enlarging the incision in the capsule, a small rim of bone was cut from the glenoid labrum. Five small holes were drilled with a right-angle dental drill from the glenoid labrum into the glenoid cavity. No. 2 silk mattress sutures were threaded through these holes, and the free margin of the distal capsule was brought over to the glenoid labrum and sutured down. The proximal portion of the capsule was then plicated into the capsule. The coracoid process was fixed back, drilled, and fixed with a No. 2 silk suture.

In this case the patient was immobilized in a Velpeau dressing for 4 weeks, followed by 2 weeks in an arm sling with physical therapy and 2 weeks of circumduction and reaching exercises. At the end of this period the patient had a fairly good range of motion in the shoulder.

Case 4.—A 23-year-old veteran with a service-connected disability first dislocated his left shoulder in July 1946 while swimming. He reduced the dislocation himself by exerting upward pressure on the left arm with the right. Nine months later he again dislocated the same shoulder while lifting a 50-pound case. A physician reduced this dislocation with simple traction on the arm without anesthesia. He was immobilized in a Velpeau dressing for 3 weeks.

Five weeks before admission the shoulder again dislocated while the patient was sleeping with the arm abducted. He relocated the shoulder, but 1 week later he again dislocated the shoulder while sleeping, which took him 3 hours to reduce. Since then he has slept with the arm immobilized in a Velpeau type dressing and has avoided a further dislocation. This case is interesting because of the fact that the patient had a similar history of dislocation of the right shoulder for which a Nicola procedure was done in November 1945. Since then he has had no further dislocation, but has limitation of abduction

to 90 degrees, some limitation of flexion, and states that the shoulder feels as though it were "giving way" while lifting a weight. Examination revealed an old Nicola scar over the right shoulder, limitation of abduction to 90 degrees, and limitation of flexion. The left shoulder was negative except for slight tenderness anteriorly to palpation. At operation the routine approach was used. An avulsion of the glenoid fibro-disk was found and a roughened area on the bony glenoid rim was found. After shaving the glenoid rim down with an osteotome, 5 small holes were drilled with a right-angle dental drill from the glenoid rim into the shoulder cavity. Heavy silk mattress sutures were used to bring the distal capsule margin down to the glenoid rim, and the proximal portion of capsule was then plicated into the capsule. The coracoid process was drilled and fixed with a No. 2 silk suture. This patient, similar to case 3, was immobilized in a Velpeau dressing for 4 weeks, followed by 2 weeks in an arm sling with physiotherapy. Two weeks of stretching and circumduction exercises were then given, after which the patient demonstrated a good range of motion in the shoulder.

SUMMARY

An attempt has been made to describe the technical difficulties involved in the Bankart procedure, step by step and the best methods, in the writer's opinion, in dealing with these hazards.

The incision extending from the outer border of the clavicle and curving to extend inferiorly along the bicipital groove gives the best exposure. Retraction of the cephalic vein medially is advisable. A thorough knowledge of the ligamentous attachments of the coracoid process is stressed. Removing the coracoid process one-half inch from its tip with a Gigli saw is suggested as the best method of removing the coracoid process. Removal of the clavicular attachment of the deltoid muscle one-half inch from its attachment gives better exposure of the shoulder joint.

Detailed and careful dissection of the subscapularis tendon from the capsule of the shoulder is emphasized. A brief description of the pathology namely an avulsion of the glenoid fibro-disk, in some cases, a rent in the capsule and sometimes an actual avulsion of the bony glenoid rim is discussed.

Twelve cases of recurrent subglenoid dislocation of the shoulder, in which the Bankart procedure was done, are reviewed as to the pathologic changes involved. In all cases an avulsion of the cartilaginous fibro-disk was found: three cases revealed a previously existing rent in the capsule, and two cases demonstrated an avulsion of bone from the glenoid labrum.

Bankart's original repair method of drilling holes from the glenoid labrum into the shoulder is discussed. Instruments and methods used to simplify this procedure are reviewed, and the fixation of the capsule to the glenoid labrum with a small vitallium plate and two screws, after first preparing a "shelf" on the labrum by removing a small rim

of bone with an osteotome, is recommended as the strongest and most time-saving procedure.

Accurate reapproximation of the subscapularis tendon and deltoid muscles is emphasized. Replacement of the coracoid process with drilling and fixation with a single vitallium screw or heavy silk suture is described.



Figure 2.—A group of five showing full range of motion after Bankart operation.

The best postoperative treatment—immobilization in a Velpeau dressing for 3 to 4 weeks followed by the use of a sling and physical therapy for 2 weeks and then circumduction and reaching exercises for 2 weeks or until optimum shoulder movement is attained—is described (fig. 2). It is also stated that these patients were discharged in 8 to 10 weeks.

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Medical Management of Cardiac Failure¹

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HEART disease continued by far to exceed all other causes of death. In a recent survey by the Metropolitan Life Insurance Co., about 4,000,000 persons in the United States are estimated to have heart disease.

When the heart fails, two things happen: (a) An insufficient amount of blood is pumped forward to the tissues through the arteries; and (b) an insufficient amount of blood is removed from the tissues through the veins. The first type of heart failure is called "forward failure," and the second type, "backward failure," commonly known as congestive heart failure or decompensation. While these forms of heart failure are frequently combined, one or the other usually dominates the picture. This article is limited to a discussion of backward failure.

Heart failure of the backward variety may involve both halves of the heart, but more frequently, the left or right side is primarily affected. Right-sided heart failure is usually well treated by the average physician, largely because the patient presents himself with fairly obvious signs such as large liver, dependent edema, and fluid in the body cavities. On the other hand, left-sided failure is frequently unnoticed until relatively late because signs may not appear for a long time. Right-sided failure can be considered the failure of signs and left-sided failure the failure of symptoms. The presenting symptom in the latter is of course, dyspnea, and it is important to emphasize that the cardiac patient who is dyspneic is just as deserving of digitalis and the other therapeutic measures to be outlined as the patient who has swollen legs. Dyspnea is often present for an appreciable length of time before moisture is found at the lung bases, and patients with dyspnea but without râles are likely to be neglected. The absence of râles suggests that intra-alveolar edema is not present, but considerable fluid may accumulate in the interstitial lung parenchyma nevertheless.

¹ Presented at a clinical conference at the U. S. Naval Hospital, St. Albans, N. Y., 7 May 1947.

Whether heart failure be right sided, left sided, or combined, the treatment has three objects: (*a*) To reduce the load on the heart; (*b*) to increase cardiac efficiency; and (*c*) to correct the disturbance in sodium-water metabolism.

The measures available to reduce the load on the heart include rest, sedation, oxygen, phlebotomy, and attempts to reduce the metabolic rate.

In putting these patients to bed, the author is just as cognizant of the hazards of phlebothrombosis, embolization, and pneumonitis as are his surgical colleagues. If it is at all possible, patients are permitted to get up for part of the time each day and then to remain out of bed as soon as possible. Bed rest is particularly hazardous for obese patients and for those with combined right- and left-sided failure in whom transfer of edema fluid from the legs to the lungs may be facilitated by the horizontal position. When bed rest is used for such patients, it is important to have a back rest and the legs somewhat dependent, care being taken to change the position frequently.

The sedative of choice in acute failure is morphine, which not only puts the patient at rest but also puts the lungs at rest by a reduction in respiratory rate. The second effect is just as valuable in reducing the load on the heart as the first. Too often morphine is given in acute pulmonary edema by the subcutaneous route and many valuable minutes are lost. Such patients should receive intravenous morphine with small doses such as one-eighth grain repeated at short intervals until a suitable effect is obtained. Senile individuals and patients with emphysema do not tolerate morphine well and in these the drug must be used cautiously.

There is little to add concerning the use of oxygen except to point out the value of a positive pressure mask when one is dealing with the intra-alveolar type of pulmonary edema. Several years ago it was felt that high concentrations of oxygen should not be used for prolonged periods of time, but now it is felt that it is perfectly safe to administer 95 to 100 percent oxygen for several days.

Phlebotomy has had its ups and downs in the history of medicine. First it was used as a panacea. Subsequently it fell into disrepute. However, the quick removal of 500 cc. of blood may be a life-saving measure in acute failure of the left side of the heart. A bloodless phlebotomy may be accomplished by the application of tourniquets, tight bandages, or blood pressure cuffs applied to all four extremities at a pressure of 60 to 80 millimeters of mercury in order to trap blood in the limbs. If tourniquets are applied, they should be released one at a time at 20-minute intervals. The simultaneous removal of all 4 tourniquets might again throw the patient into acute failure.

About a decade ago total thyroidectomy was introduced with the object of decreasing the cardiac load in patients with organic heart disease, but without hyperthyroidism. In general, the results of these operations have been disappointing and they are rarely done now. More recently, thiouracil and 6-propyl thiouracil have been used with the same object. While suppression of thyroid function may bring about dramatic improvement in cardiac patients who have hyperthyroidism, it is questionable whether such measures are of value when thyroid function is normal. Experiments with thyroid-suppressive drugs are being continued and the results have not been published.

The cardiac load having been reduced to a minimum, an attempt can be made to improve cardiac efficiency directly and to this end use is made of the digitalis glucosides, quinidine, and aminophyllin. With rare exceptions, digitalis is indicated in every patient who has congestive heart failure. Its use is contraindicated in the presence of paroxysmal ventricular tachycardia, where the danger of conversion to ventricular fibrillation (a lethal condition) exists. This arrhythmia, in which digitalis is contra-indicated, constitutes the only indication for quinidine when congestive failure is present. Here quinidine may be a life-saving measure and should be administered promptly, and if necessary, by vein, and in full therapeutic doses.

Recent work has significantly changed our concepts of digitalis therapy. The inaccuracies attendant upon the "cat" method of assay have been demonstrated and crystalline digitalis glucosides, which can be prescribed by weight without biologic assay, have been made available. This does not mean that whole digitalis leaf need be thrown into the discard. When properly assayed it still offers an inexpensive method of control. However, in addition to the inaccuracy of dosage, whole digitalis leaf has the further disadvantage of irritation to the gastric mucous membranes when given in large amount. The purer glucosides, which are more completely absorbed, can be administered in considerably smaller doses and make possible more rapid digitalization without vomiting.

Four glycosides, namely, ouabain, lanatosid C, digoxin, and digitoxin, are considered briefly. Ouabain, when given intravenously, will begin to have its effect within a matter of minutes and will have its full effect in about 2 hours. An average digitalization dose is 0.75 to 1 mg. The drug is completely eliminated in about 3 days. Ouabain is the drug of choice in emergencies because it is the most rapidly effective digitalis product. An initial dose of 0.5 mg. followed by supplements of 0.10 mg. at 30-minute intervals to a maximum total of 1 mg. makes possible rapid and safe digitalization. While excellent for intravenous use, ouabain is practically never used by mouth because of irregularity of its absorption from the gastro-intestinal tract.

Therefore, its use must be supplemented by oral administration of one of the other glycosides. Digitoxin, by vein, takes longer for maximum effect than ouabain, a full effect usually not being obtained in less than 6 hours, and this glycoside requires about 3 weeks for total elimination. Because of the slowness with which digitoxin reaches its maximum effect, it is not as satisfactory as ouabain for intravenous use when hours may make the difference between life and death. However, digitoxin has a definite advantage over all the other glycosides in that it alone is fully absorbed when given orally, and the oral and intravenous doses are practically the same, about 1.2 to 1.5 mg. This dose is 1/1000 that of whole digitalis leaf.

In between ouabain and digitoxin in rapidity and duration of effect are Lanatocide C, also known as cedilanid, the intravenous dose of which is 1.6 mg. and the average oral dose 7 mg., and digoxin, the average intravenous dose of which is 0.7 to 1 mg. and the average oral dose $3\frac{1}{2}$ mg. for full digitalization.

Intravenous digitalization frequently is not necessary. For oral use, it is probably preferable for the average doctor to limit himself to one or two digitalis preparations which he knows well rather than to change from one to another with variations in dosage that may not be clearly understood. The daily oral maintenance dose for digitoxin is 0.1 to 0.2 mg., for cedilanid 0.5 to 1 mg., and for digoxin 0.5 to 0.75 mg.

Aminophyllin is a valuable drug, particularly in left-sided heart failure, if used in adequate doses. It tends to increase cardiac output, to relax smooth muscle, and to produce diuresis. It is particularly valuable in the treatment of cardiac asthma and of Cheyne-Stokes breathing. It is frequently used in doses which are too small to be effective because of the gastric irritation produced. Rectal use in doses of $7\frac{1}{2}$ grains two or three times a day should be considered if the patient is unable to tolerate doses of $4\frac{1}{2}$ grains by mouth. The commonly used dose of $1\frac{1}{2}$ to 3 grains has not been very satisfactory in my experience. At times it is necessary to substitute other xanthine derivatives for aminophyllin when the patient will not tolerate the doses prescribed.

The attempt having been made to reduce the load on the heart as far as possible, and to increase cardiac efficiency with digitalis, aminophyllin, and quinidine, attention is directed to the disturbance in sodium-water metabolism, which plays such an important part in the symptoms produced by congestive heart failure. The therapy includes diet, diuretics, and paracentesis. Until very recently it was customary to restrict fluids, and the Karell diet, which consisted of 800 cc. of milk in 24 hours, used to be the classical method of dealing with severe congestive heart failure. Recent workers have emphasized

the importance of sodium restriction rather than water restriction and have pointed out that fluids may be given freely if a negative sodium balance is maintained, with a diuretic effect rather than a tendency to retention.

Schemm has advocated a diet which contains 2 gm. of sodium, supplemented by the administration of 4,000 cc. of fluids daily. While the forcing of fluids in accordance with Schemm's method has not met with wide acceptance, most cardiologists today allow the patient to take as much in the way of fluids as he will, provided his 24-hour sodium intake is maintained at less than a 2-gm. level. The Kempner rice diet, which includes rice, sugar, fruits, and fruit juices, the sodium content of which is 0.2 grams, is a very satisfactory program for cardiac patients in failure, but it is low in protein and difficult to maintain for more than a short period of time. In addition to the sodium content of this diet, an acid ash has been recommended to further promote diuresis. In most instances, this modification is unnecessary because of the efficacy of the mercurial diuretics.

The mercurials constitute the best single agent. Too often they are not given frequently enough and are not continued for a sufficiently long period of time. The initial dose should be 0.5 cc. given slowly by vein. Most patients tolerate a 2 cc. dose well and this dose can be repeated daily if necessary and should be repeated at that interval which will maintain the patient at his so called "dry weight."

The mercurials can be administered intramuscularly, as well as intravenously and the intramuscular route is safer, but it usually does not produce as good a diuretic response and can be associated with considerable pain. Serious toxic effects caused by the mercurial diuretics are rare, and should not prevent one from using these agents, which have done so much to prolong the lives of cardiac patients in failure.

Ammonium chloride, in doses of 60 to 90 grains a day, is frequently used to augment the action of the mercurials. Urea is another valuable diuretic agent, which may be used to supplement the mercurials or in patients who do not tolerate them. The average dose is one-half ounce three times a day, diluted in iced coffee or cold fruit juice, to disguise the taste.

The great majority of these patients in congestive failure respond well to the type of program outlined and can be maintained in a compensated state for long periods of time. When the response is poor, one must be careful to rule out one of the following complicating factors: hyperthyroidism, anemia, vitamin deficiency, particularly B deficiency, renal disease, hypoproteinemia, and pneumonitis. Failure is likely to progress and to terminate fatally in the presence of these complications.

One must always be on guard in order not to miss the common complicating factors, because each may be correctable and specific therapy may convert a desperately sick patient in uncontrolled failure into a well-compensated patient.



Fatal Coronary Arteriosclerosis in Young Adults

Report of Two Cases

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ARTERIOSCLEROSIS of the coronary arteries so severe as to cause death usually does not occur before middle age. Only a few cases of fatal coronary arteriosclerosis occurring before the age of 30 were reported before the recent war. Among cases of coronary occlusion proved at autopsy at the Massachusetts General Hospital between the years 1914 and 1934, Sprague and Orgain (1) found only 2 under 30 years which were caused by arteriosclerosis. Both of these were males aged 15. Glendy, Levine, and White (2) stated that in 100 cases of clinically established coronary arteriosclerosis in persons under 40, 8 were between the ages of 20 and 29. At the time of the report, however, none were dead. Including the 2 cases of Sprague and Orgain (1), Master, Dack, and Jaffe (3) found at autopsy only 16 cases under the age of 30 which were reported in the literature. One was an infant 7 months old. Between 10 and 20 years there were 7 cases and from 21 to 30 there were 8 cases. An additional case, aged 27, was found among 500 cases of coronary occlusion studied by these authors. After 1939, reports of isolated cases were recorded by Zacks (4), Miller and Woods (5), and Richards (6).

In 1944, however, French and Dock (7) reported their studies of 100 fatal cases of coronary arteriosclerosis in American soldiers from 20 to 36 years of age. In 80 of these cases, death was due to uncomplicated coronary arteriosclerosis. Of these, 39 were under 31 years of age. In a study of 50 such cases occurring in young adults in the British Army, Newman (8) reported that 26 were under 30 years.

In civilian hospitals in which the majority of patients are in the older age groups, fatal coronary arteriosclerosis in young adults is

¹ Inactive.

rarely seen. From the brief review presented here it is apparent that this disease is not actually rare when the medical records of large groups of young adults are available for study. However, there is still need for emphasis on the fact that coronary arteriosclerosis does occur in young adults and is often fatal. For this reason, we are reporting the histories and autopsies of two young men aged 25 and 26 in whom a clinical diagnosis of psychoneurosis was at first made, but in whom death was caused by coronary arteriosclerosis.

CASE REPORTS

Case 1.—W. J. S., a 26-year-old white male, was admitted to the hospital on 4 July 1944, with the chief complaint of pain in the chest. His father had died of angina pectoris at an unstated age, and his mother had heart disease. The patient was well until the day of his induction in the Army in November 1943 when he had a sudden severe precordial pain accompanied by syncope. Following this episode he spent 68 days in an Army hospital until his discharge from the service. He was told that his illness was caused by "nerves." From that time on he had occasional brief attacks of precordial pain at any time of the day or night. The pain usually radiated into the left shoulder and inner side of the left arm and was accompanied by a feeling of numbness in the arm and hand. He had no other symptoms. About a week before admission, an attack lasted for several hours. On the day of admission, the pain recurred soon after he arose and persisted without relief.

On examination, he was apprehensive and complained bitterly of precordial pain. Blood pressure was 90 systolic and 75 diastolic. There were signs of congestion in the lower lobes of both lungs, but the liver and spleen were not palpable and there was no peripheral edema. The heart appeared normal. Because of a cardiac rate of 112 and a temperature of 102° F. he was at first thought to have atypical pneumonia. However treatment with sulfadiazine and penicillin was not beneficial. It soon became apparent, however, that the patient was suffering from congestive heart failure caused by coronary arteriosclerosis and thrombosis. He grew progressively worse. The pulse rate rose to 140 and respirations to 56. He became increasingly cyanotic and orthopneic and died on 14 July, 10 days after admission.

Important laboratory work included electrocardiograms which showed sinus tachycardia, P-R interval of 0.14 sec., QRS complex of 0.07 sec., deep Q-waves in leads 2 and 3; RS-T segment isoelectric, and inverted T-waves in leads 2 and 3. The interpretation of these findings was a former posterior myocardial infarction. A bedside roentgenogram of the chest showed marked congestion at the bases of both lungs. There was a slight leukocytosis. The blood Kahn test was negative. The remainder of the laboratory reports were not contributory.

Autopsy Report

Anatomical diagnosis.—Advanced arteriosclerosis of root of aorta, sinuses of Valsalva, and coronary arteries; extreme narrowing of lumens of coronary arteries; old and recent infarcts of left ventricle; mural thrombus endocardium of left ventricle; fibrinous pericarditis; chronic passive congestion of lungs, liver, and spleen; hydrothorax, bilateral; peripheral edema.

Body.—The body was well nourished and well developed. The legs were edematous. In the left pleural cavity were 1,500 cc. of clear straw-colored fluid and 2,000 cc. were present in the right pleural cavity. The organs grossly and microscopically showed evidence of chronic passive congestion. The brain and spinal cord were not examined.

Heart.—The heart weighed 450 grams. The epicardium and pericardium both anteriorly and posteriorly were united by fibrinous adhesions. The left ventricle was slightly hypertrophied and all chambers were dilated. The main coronary arteries showed advanced degrees of arteriosclerosis. Near the sinus of Valsalva the lumens were narrowed by large atheromatous and calcific plaques. The interventricular septum and both lateral walls of the left ventricle near the apex were thin and fibrous. Firmly attached to the endocardium of the left ventricle at the apex was a laminated gray-red clot about 2 cm. in diameter.

Microscopically, this clot was obviously thrombus into which fibroblasts were proliferating from the endocardium. Beneath the endocardium in this region, most of the muscle fibers were either undergoing degeneration and necrosis or were replaced by dense fibrous scar. In the sections of coronary arteries examined, recent thrombi occluding the lumens were not detected. The lumens were, however, markedly narrowed by atheromatous and calcific plaques in the intima. In the case of the anterior descending and circumflex branches of the left coronary artery, the lumens were so small and eccentric as to suggest recanalization (fig. 1). Similar atherosclerotic plaques were present in the root of the aorta. The aorta and myocardium showed no other lesions.

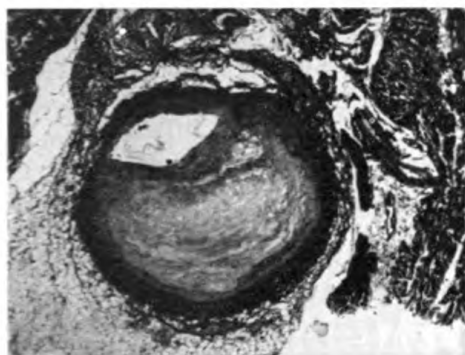


Figure 1.—Case 1. Photomicrograph of anterior descending branch of left coronary artery shows a large calcific atheromatous plaque which almost occludes the lumen.



Figure 2.—Case 2. Photomicrograph of the anterior descending branch of the left coronary artery shows two large calcific atherosclerotic plaques which have reduced the lumen to a mere slit.

Case 2.—O. E. H., 25-year-old white male, was admitted to the hospital on 6 December 1945, with the chief complaints of precordial pain, palpitation, and dyspnea. For the past year and a half he had noticed progressive and increasing dyspnea on exertion. For the past 3 months he had a suffocating feeling in the precordium which radiated to the neck, teeth, and both arms. The pain was relieved only by rest. There was also slight swelling of his ankles. During childhood he had frequent attacks of tonsillitis and recurrent pains in all his joints. At the age of 15 he was confined to bed all winter because of joint pains. Following this he played actively in sports, had good exercise tolerance, and did not have a recurrence of joint pain. His mother, father, and one brother died of

heart disease. Two brothers and two sisters were living, but were said to have heart disease.

On admission his temperature was 99° F., pulse 80, respirations 20, and blood pressure 132 systolic and 80 diastolic. He seemed anxious about his condition. He was not objectively dyspneic or orthopneic. There were scattered râles over the lower part of both lung fields. The heart was not thought to be enlarged, but there was an inconstant systolic murmur over the mitral area. The liver edge extended to the right costal margin.

All laboratory studies except electrocardiograms were within normal limits. Two electrocardiograms showed: rate 80 per minute; rhythm normal; P-R interval 0.14 second; QRS 0.06 second. QRS slurred in lead 4; S-T segments isoelectric; and T-waves normal.

The clinical impression was neuro-circulatory asthenia with no evidence of organic heart disease and he was discharged from the hospital on 18 December 1945. On 27 December 1945, during routine physical exercises, he had an attack of dyspnea and extreme weakness and suddenly died.

Autopsy Report

Anatomical diagnosis.—Marked arteriosclerosis of root of aorta and coronary arteries; recent questionable myocardial infarction; dilatation of heart; acute and chronic passive congestion of most organs; hyperplasia of thymus and lymph nodes.

Body.—The body was well developed and well nourished. The thymus weighed 50 grams and most of the lymph nodes were from 1 to 2 cm. in diameter. None, however, were abnormal microscopically. Most of the organs, including the lungs, liver, spleen, and kidneys were engorged with blood and microscopically showed acute passive congestion, but there was no peripheral edema. There were no other remarkable lesions.

Heart.—The heart weighed 350 grams. Although all the chambers of the heart were dilated, there was no evidence of hypertrophy. In fact the myocardium of the left ventricle was pale and flabby. No focal lesions were seen in the myocardium. The leaflets of the valves appeared normal, but the ring of the mitral valve was dilated. Large atheromatous plaques were present in the sinuses of Valsalva and the root of the aorta, but the rest of the aorta showed only minimal accumulations of fat in the intima. The lumens of the main coronary arteries were extremely small as the result of large atheromatous plaques in the intima. On section, however, thrombi were not grossly visible in the lumen.

Microscopically there were no areas of recent infarction of the myocardium. There were several small irregular areas of fibrosis in the myocardium of the left ventricle. In the sections of coronary arteries examined recent thrombi occluding the lumens were not detected. However, the lumens were extremely narrowed by atheromatous and calcific plaques in the intima. The lumens of the anterior descending and circumflex branches of the left coronary artery were reduced to mere slits (fig. 2).

COMMENTS

In both cases the symptoms prior to death were typical of angina pectoris, and histories of familial heart disease were elicited, yet in each the original diagnosis was psychoneurosis. Undoubtedly the youthfulness of the patients at first misled the examiners in determin-

ing the true character of the disease. However, the correct diagnosis was made before death in case 1, but in case 2 the patient was returned to duty without recognition of the organic basis of the symptoms and he died a few days later during a period of exercise.

Although evidence of repeated myocardial infarction was found at autopsy in the first case, neither coronary thrombosis nor myocardial infarction were demonstrated in the second case. The degree of coronary arteriosclerosis and calcification was so extensive in the latter, however, as to constitute an adequate cause for the symptoms and mode of death.

Except for the coronary arteries in both cases, only very slight arteriosclerosis was present in most of the aorta and the peripheral arteries and the lesions were no greater than would be expected in men of this age. The calcific arteriosclerosis of the coronary arteries was thus an unusually limited lesion. Morphologically, however, the lesions were no different from those seen in individuals of more advanced age. This similarity in the character of coronary arteriosclerosis in youth and in old age was commented upon by French and Dock (7). At the same time, the study of the present cases gives no new information on the pathogenesis of coronary arteriosclerosis in either young or old.

In case 1 the heart was not hypertrophied and only slightly so in case 2. French and Dock (7) found that the hearts of such cases are only slightly heavier than normal and somewhat less heavy than in older individuals.

Recently one of us (R. F. N.) reported the cases of 6 young men under 30 who died of unexplained congestive heart failure and cardiac hypertrophy (9) (10). Most of them at some time complained of precordial pain and dyspnea and electrocardiograms showed evidence of myocardial damage. Difficulty might easily arise in differentiating this disease or syndrome from premature coronary arteriosclerosis. At times this may be impossible. In the case of the former, however, the precordial pain, when present, did not radiate in the manner characteristic of angina pectoris and the hearts were all distinctly hypertrophied.

The conclusion is obvious, therefore, that in the case of any youth who complains of symptoms which in older subjects are suggestive of angina pectoris the possibility of coronary arteriosclerosis should be thoroughly investigated. According to the statistics of French and Dock (7), however, only a little over one-third of their cases had prodromal symptoms which suggested heart disease and in many cases the symptoms were so slight that the individuals did not seek medical attention before the final episode leading to death. Furthermore when this episode occurred, only one in eight lived more than an hour.

In short, coronary arteriosclerosis in youth is apt to cause sudden or unexpected death. For this reason, in only a minority of cases is a clinical diagnosis possible.

SUMMARY

1. The clinical and pathologic findings in the cases of two men, aged 26 and 25, who died of coronary arteriosclerosis are presented.

2. The preliminary diagnosis in each was psychoneurosis although the symptoms were characteristic of angina pectoris.

3. Fatal coronary arteriosclerosis is common in young men and is usually unrecognized because many die suddenly and because in the case of patients having prodromal symptoms of angina pectoris there is a tendency for clinicians to overlook the possibility of coronary arteriosclerosis.

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Coarctation of the Aorta

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ALTHOUGH coarctation of the aorta is not too frequently seen in military medical practice, it is, according to certain authorities (1) (2) (3), one of the most common congenital anomalies of the heart. Fortunately many cases are now amenable to treatment by surgery.

Since coarctation of the aorta was first described in 1791 it has been the subject of many excellent dissertations. The fact that so much has been written about it in the past might well discourage one from presenting a single case (4). Nevertheless, the frequency with which it is overlooked clinically, and the fact that most of the cases reported have been diagnosed only at the autopsy table or after cardiac signs and symptoms had become apparent, is considered ample reason for the present article.

Of nearly 200 cases reported, according to Blackford (2), only 19 were definitely recognized clinically. Lewis (4) admitted that several cases under his care went unrecognized for some time. The mass chest roentgenograms now being taken by the United States Public Health Service and the armed services are increasing the likelihood that many more cases will be recognized even in the absence of other clinical evidence.

Because of the elevated blood pressure usually found in the brachial arteries most undiagnosed cases of coarctation of the aorta are mistakenly considered to be essential hypertension, or occasionally, hyperthyroidism. This is mainly due to the fact that the anomaly is not kept in mind, and consequently the examiner fails to take blood pressure readings in the legs as well as in the arms, and to examine the thorax for evidence of pulsating collaterals (5).

According to White (6) there are two types of coarctation of the aorta, infantile and adult. The infantile type is very serious, usually associated with other grave anomalies, and is incompatible with long life, the average duration in nine "primary" cases (3), being only 8 hours; the longest 9 months. This type usually consists of narrowing of the entire isthmus of the aorta, that portion between the left sub-

clavian artery and the ductus arteriosus. Obviously, nothing can be done to correct such a defect.

In the adult type there is localized constriction of the aorta at, or just below, the insertion of the ductus arteriosus. It is much more common than the infantile type, less commonly associated with other defects, and much less serious. It is the only type persisting after the first year of life. All grades of narrowing of the aorta occur from that which is so slight that it is scarcely apparent even upon close post-mortem scrutiny, up to complete local aortic obliteration. It is three times more common in the male (6).

Life expectancy without surgical treatment varies from 20 to 50 years, although one patient was reported to have lived to the age of 92.

The results of marked coarctation of the aorta include dilatation and elongation of the aorta proximal to the constriction, sometimes with aneurysm, and often, but not always, narrowing of the descending aorta below. The collateral circulation may be developed to a high degree to carry the blood to the lower part of the body. This is manifest by greatly dilated and tortuous internal mammary, scapular, and intercostal arteries, the latter causing the characteristic erosion (scalloping) of the lower borders of the ribs seen by roentgenogram.

The hypertension is responsible for the cardiac hypertrophy as a rule, but according to White (6) and Rytland (7) and others, this hypertension is not due directly to the stenosis, but secondarily, to the diminution of renal blood flow and to renal cortical ischemia (Goldblatt type of hypertension). Brothner (8) and others express the opposite view that this hypertension is due solely to the mechanical stricture of the aorta, and not to renal pressor substances. In the light of recent discoveries in the physiology of the kidney (9) this latter view seems to explain the hypertension.

Fatal termination in the adult type of coarctation is usually due either to heart failure (33 per cent), cerebral hemorrhage, dissecting aneurysm of the aorta, or to bacterial endocarditis. It is apparent that early recognition of the condition may prolong life either by measures directed toward the prevention of these cardiovascular complications (10) or by surgical intervention (as perfected by Dr. R. E. Gross of Boston and his associates).

Since the disease is characterized by hypertension in the upper extremities and hypertrophy of the left ventricle, the electrocardiogram will show typically left axis deviation, left heart strain, and other signs of left ventricular enlargement similar to those seen in essential hypertension and aortic valve disease. However, Master (11) states that several cases observed by him failed to reveal any axis deviation in spite of the presence of severe hypertension in the upper extremities and definite left ventricular hypertrophy. The

explanation of this is not clear, although it may be due to the fact that the predominant hypertrophy occurs in the subaortic regions where it may not produce significant left axis deviation.

According to the American Heart Association (Pardee) (12), the major criteria of coarctation of the aorta are as follows: (a) Erosion of the margins of the ribs, absence of aortic knob, and dilatation of the ascending aorta on radiography; (b) high blood pressure limited to the upper extremities; (c) a loud systolic murmur audible over the manubrium sterni and in the left interscapular area; and (d) pulsations of the subscapular, intercostal, and internal mammary arteries.

Any of these criteria may be absent in a given case but they were all present in the case described in the accompanying case report. Perhaps the most constant and easily detectable clinical feature of this disease is the disparity between the blood pressure in the upper and the lower extremities, that in the brachial arteries being almost invariably higher than that recorded in the popliteal arteries (13).

CASE REPORT

A white 19-year-old Marine Corps recruit was admitted to the hospital on 20 August 1947 because of a heart murmur heard at routine physical examination after his arrival at the recruit depot. His only complaints were shortness of breath upon exertion, occasionally accompanied by a "burning pain" in the heart region. Other cardiac symptoms were denied and no history of rheumatic fever could be elicited. However, he knew that his heart murmur had been present since infancy and that he had always been regarded as a cardiac invalid. At the age of 2 he suffered a severe attack of pneumonia. He also had most of the usual childhood diseases. After starting to school at the age of 5 his murmur was "discovered" and he was enrolled in a special cardiac class which met in the open air and had a 2-hour rest period every afternoon. He was not permitted to participate in sports, and he says the pills they gave him "did no good." One day during class he fainted in a chair. After leaving grammar school he entered high school where again he was placed in special open-air classes because of his cardiac condition.

After leaving high school he attempted to get a job but was rejected after a physical examination. Finally he obtained a job as a textile painter, but after 4 or 5 days he was suddenly seized with a severe pain in his chest, accompanied by extreme dyspnea and hemoptysis. He was hospitalized for a month, during which time he lost 23 pounds in weight.

Following discharge he had a severe upper respiratory infection, but no further hemoptysis occurred. When he was 17 he attempted to join the Navy and was rejected. The following year he tried to join the Army but was again turned down. He felt very keenly the taunts of his friends about being classed 4-F, and not being able to keep a job. He tried to join the merchant marine and again his cardiac condition caused him to be rejected. Finally he went to the Marine Corps recruiting office, and much to his joy (and amazement) he was accepted for recruit training.

Family history.—His mother died in diabetic coma when he was 13, and his father has "severe heart trouble" with chronic bronchitis. There is no family history of tuberculosis or cancer.



Figure 1.—Coarctation of the aorta, showing slight enlargement of the left ventricle, elongation and dilatation of the ascending aorta, and erosion (scalloping) of the inferior borders of the ribs.

sixth interspaces. It radiated downward, both to left and to right and was audible in the back, over the midthoracic vertebrae, and in both right and

Physical examination.—A 19-year-old asthenic white male weighing 140 pounds and 70 inches tall, not acutely ill. Temperature 99° F.; pulse 72 per minute; respiratory rate 18 per minute. There was no obvious cyanosis. Blood pressure in right brachial artery was 166 systolic and 110 diastolic; that in left brachial artery was 174 systolic and 118 diastolic. Pulsations were absent in the femoral dorsalis pedis, and posterior tibial arteries. Repeated attempts to obtain blood pressure readings in either popliteal artery failed. Eyes, ears, nose, and throat were normal. Tonsils were present, but not inflamed. Lung fields were clear and resonant throughout. Pulsations were felt in the subclavian arteries on both sides. The heart was not enlarged to percussion or auscultation. There was normal rhythm and the rate was regular. A constant loud, harsh, systolic murmur was heard, most audible over the left sternal border in the fourth, fifth, and

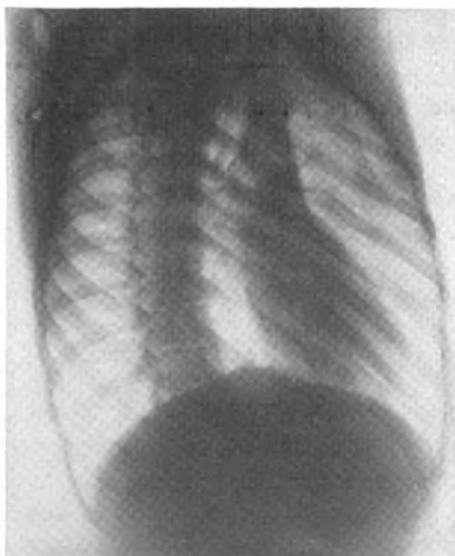


Figure 2.



Figure 3.

Figures 2 and 3.—Oblique views, showing elongation and dilatation of the ascending aorta and the narrow descending aorta, and the relatively clear retrocardiac space.

left interscapular spaces. A Schneider index of circulatory efficiency gave an index of plus 15, of a possible score of 18, a surprisingly good result for such a case.

Routine urinalysis on one occasion showed presence of 1 plus sugar. A fasting blood sugar was within normal limits—93 mg. per 100 cc. of whole blood. Blood sedimentation rate was 5 mm. in 60 minutes (Cutler). Hemoglobin 13 gm. (92 percent), leukocytes 7,300, with normal differential. Blood serology was negative.

Cardiometric roentgenogram of chest showed: ML 5.0 cm., MR 7.0 cm.; TD 12 cm., L 15.6 cm., and AA 6.0 cm. The heart shadows appeared to be elongated, slightly enlarged, and somewhat boot-shaped; and the ascending aorta appeared to be widened. The descending aorta and aortic knob could not be visualized in the P. A. view (figs. 1, 2, and 3). The diagnosis was confirmed by the irregular scalloping of the lower borders of the ribs seen in this view. Oblique views further confirmed the diagnosis, revealing in addition, a narrow descending aorta in contrast to the elongated and dilated ascending aorta and a relatively clear retrocardiac space. The electrocardiogram (fig. 4) showed normal sinus rhythm, with a rate of 75 per minute. The P-R interval was 0.20 second, and the axis deviation was normal. T waves were upright in leads I and II, and diphasic in lead III. There was a small Q wave in lead III and the QRS complex occupied 0.05 second. The precordial leads revealed some elevation of ST segments in CF-1, CF-2, and CF-3 with low flat T waves in CF-5 and CF-6, consistent with a slight degree of left ventricular strain, in spite of the normal axis deviation shown by the limb leads.

The patient was discharged as unfit for military or naval service and referred to a large medical center for possible surgical treatment.

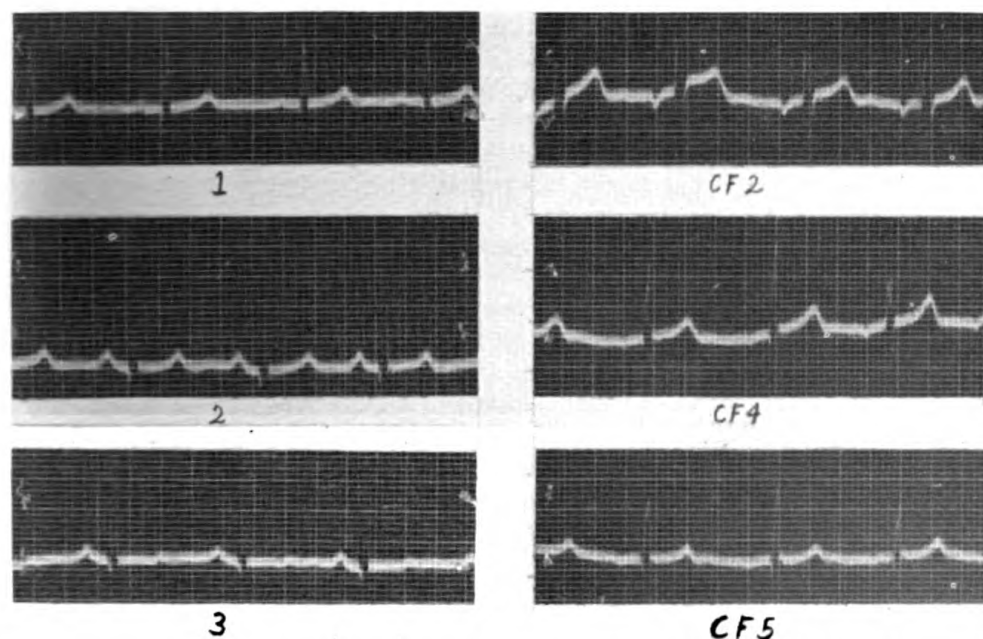


Figure 4.—Electrocardiogram from case of coarctation of the aorta. No abnormalities are noted except for slight elevation of the ST segment in Lead CF-2, which is consistent with some degree of left ventricular strain which one would expect to find in this condition. There is normal axis deviation as shown by the limb leads.

SUMMARY AND CONCLUSIONS

1. Coarctation of the aorta is a relatively common congenital cardiac anomaly which frequently is either unrecognized clinically or is misdiagnosed as essential hypertension.

2. The most constant and most easily recognizable feature is a blood pressure higher in the upper extremities than in the legs.

3. Although it has not been definitely established, the most probable cause of the hypertension is the mechanical effect of the aortic constriction rather than ischemia of the renal cortex.

4. The diagnostic criteria are reviewed and a case report given which clearly illustrates the various criteria.

5. The electrocardiogram is of little specific value in the diagnosis of this condition.

6. In every case of hypertension encountered in military or naval personnel, coarctation of the aorta should be kept in mind, and the blood pressure taken in the lower as well as in the upper extremities.

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Infectious Mononucleosis

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FROM February 1946 through July 1947, 35 cases of infectious mononucleosis were admitted to the United States Naval Hospital, Annapolis, Md., out of a total of 3,301 admissions, exclusive of dependents. These cases were not admitted in any large group of epidemic proportions but were spread fairly equally throughout the year, with a tendency for more frequent admissions in the fall. The authors were surprised at the number of cases of this disease occurring in such a comparatively small group of persons. There are about 2,900 midshipmen enrolled here and about 2,700 officers and enlisted men on duty in this naval district. Of the 35 cases of infectious mononucleosis, 19 were midshipmen.

Most observers refer to sporadic cases although several small epidemics have been reported (1) but nowhere could we find evidence of endemic areas for this disease. However, in light of the number of cases seen by us, we feel that in this area the disease is endemic.

The cause of this disease is as yet unknown, although Vanden Berghe and Liessens in 1939 (2) produced a heterophile titer in a *Macacus* monkey injected with emulsions of lymph nodes removed for biopsy, which indicates the possibility of a virus as a cause of the disease.

The incubation period has been variously described as 7 to 9 days (3) and 5 to 15 days (4). In the series of cases presented here the incubation period was found to average 7 days. This was felt to be as accurate as it is possible to be, since the patients involved, particularly the midshipmen, were under constant medical attention.

The patients in this series were put on open medical wards and were not isolated, since the writers did not feel that infectious mononucleosis was spread by droplet infection, or that it was highly contagious. No proved cases of contagion from patient to patient resulted from this manner of handling persons with this disease during the period covered in this report.

DIAGNOSIS

The diagnosis of infectious mononucleosis was established by careful history, physical examination, and laboratory studies, the latter being the most important, as will be evidenced later in a review of the atypical features of the disease in many of these patients.

As a laboratory diagnostic aid, the Davidsohn test, or heterophile antibody reaction, is used exclusively at this hospital, and it is thought by some investigators to be accurate and diagnostic if agglutination occurs in a dilution of 1:28 (5) or above with the "correct" differential absorption test. These differential tests are based on the differential absorption of sheep-cell agglutinins in serum of different types of case. Sheep-cell agglutinins in normal serum are absorbed by guinea-pig kidneys but not by beef cells. Agglutinins in the serum of patients with infectious mononucleosis are absorbed by beef cells and not by guinea-pig kidneys, and serum of persons with serum sickness by both guinea-pig kidneys and beef cells. Consequently, the differential tests are only important in the question of serum sickness. In the diagnosis of infectious mononucleosis the authors also have learned to attach great importance to the blood smear and the differential count. An experienced laboratory technician can usually find cells typical of infectious mononucleosis, although it is sometimes extremely difficult early in the disease to recognize typical cells, as it takes some time after the development of symptoms for the blood smear to show typical cells (6). Morphologically, the cells in infectious mononucleosis are abnormal in structure and present atypical mononuclear elements. The most characteristic cells have ragged, irregular edges with abundant cytoplasm, frequent vacuolization, and will stain darker blue with Wright's stain than normal lymphocytes. The combination of fine vacuolization and basophilia gives the cytoplasm a foamy appearance.

In summary, the diagnoses were established on typical history and physical findings plus the hematologic findings of a lymphocytosis with typical cells and a presumptive serologic titer (Davidsohn) of 112 or above. The authors tried to make the cases fit all three diagnostic criteria, although most observers believe that if two of the three aspects of the disease—that is, clinical, hematologic, or serologic—are present and positive, the diagnosis is made (5). Although there were many cases with Davidsohn titers of 1:28 and 1:56 they were not included in the series, since 1:112 was set as an arbitrary figure for diagnosis.

COURSE OF THE DISEASE

All the cases were uncomplicated. Although many cases presented confusing pictures, none were seriously ill, and none showed any

cerebral or pulmonary pathologic abnormality of note. The typical patient was sick for about two weeks, a period conforming with that of other observers, and then began to improve and was discharged to light duty about 3 weeks after admission. Some patients were sick as long as 55 days. Only supportive and symptomatic measures were used. All were bed patients with bathroom privileges and were fed as attractive a diet as the dietitian could devise, since many presented extreme anorexia on admission. The criteria for discharge were: (*a*) subjective improvement, coupled with normal temperature for 72 hours; and (*b*) steady improvement in the blood count on weekly or more frequent checks. Some patients were given penicillin before diagnosis was made because they showed evidence of pharyngeal infection, but it was felt that this had little or no influence on the course of the disease.

The protean manifestations of this disease were impressive, many cases were not diagnosed until several days after hospitalization. The most frequent admission complaints, in order of frequency, were: Sore throats, headache (usually frontal), fever, swollen glands, upper respiratory infection, fatigue, malaise, nonproductive cough, and anorexia. The most frequent physical findings in order of frequency were: Reddening of the posterior pharynx with lymphoid hyperplasia, lymphadenopathy, generalized and anterior and posterior cervical chains, petechiae of the mucous membrane of the mouth, and various skin rashes (morbilliform, maculopapular, vesicular.)

The most interesting development in this series was the number showing buccal mucosa and hard and soft palate petechiae. The writers were unable to find this reported anywhere else except as a minor and infrequent manifestation of the disease. Of the 35 cases 9, or 25 percent, showed, on admission or during their course, definite crops of petechiae. These were in no way different from the petechiae encountered in other diseases and appeared to be no indication of the severity of the illness, nor to appear, as far as could be determined, at any particular time after the onset of the disease. In the authors' experience these petechiae were so common in infectious mononucleosis that a great deal of diagnostic emphasis was placed on them.

No attempt was made to divide the cases into types, since there did not seem to be any agreement concerning this among earlier investigators, some dividing infectious mononucleosis into: (*a*) Glandular, (*b*) pharyngeal, (*c*) febrile, and (*d*) icteric (7); while others distinguished (*a*) glandular, (*b*) respiratory, (*c*) meningeal, and (*d*) abdominal (8). It was felt that the cases presented here fitted no distinct type and that there was too much overlapping to make it feasible to discuss types.

TYPICAL CASE REPORTS

To exemplify the protean aspects of this disease four case histories with the findings and course are presented.

Case 1.—R. S., age 20. Admission diagnosis: Hepatitis, acute. History: Stuffy, running nose for 1 week; weakness and dizziness for 2 days; chills and fever for 1 day; pain in the low back for 1 day; nausea without vomiting for 12 hours, with loss of appetite; dark urine, with frequency for 12 hours; and yellow sclerae for 12 hours. Physical examination revealed a normal temperature, icteric sclerae, injection of the nasopharynx, and tenderness in the right upper quadrant. Course: The sixth day the patient developed morbilliform rash on his trunk and extremities with a palpable cervical node and a red throat. On the seventh day the patient developed pruritis with a generalized erythematous, coalescing papular rash with no involvement of the face. On the eighth day the rash faded and on the tenth day the rash was gone. The temperature was 99° to 100° F. until the eighth day. Patient was discharged on the twenty-fourth day. The laboratory reports on admission showed: Icteric index, 17; red blood cells 5,740,000, with 16 grams of hemoglobin; 13,450 white cells with 13 segmented forms, 3 banded forms, 84 lymphocytes, 1 eosinophile, the lymphocytes being typical of infectious mononucleosis. The third day his urine was positive for bile. The Davidsohn test on the third day was presumptive 1:3,584. On the twelfth day his icteric index was 7.5; on the ninth day his white blood cell count was 13,500 with 7 banded forms, 42 segmented forms, 47 lymphocytes, 3 eosinophils, and 1 band. On the nineteenth day he had 8,400 white blood cells with 3 juveniles, 9 banded forms, 36 segmented forms, 50 lymphocytes, and 2 mononuclears.

Case 2.—L. P., age 19. Admission diagnosis: Tonsillitis, acute. History: Headache and muscle pain for 4 days; anorexia for 2 days; vomiting without nausea for 2 days; sore throat for 2 days. Physical examination revealed a temperature of 101.2° F.; pharynx injected; red, edematous tonsils covered with a white exudate; posterior cervical, nontender adenopathy. Course: Fairly normal, having a temperature of 99° to 100° F. until the fifth day. The glands receded on the twenty-first day and he was discharged on the twenty-third day. Admission blood count was 4,950,000 red blood cells with 14.5 grams of hemoglobin, 6,600 white blood cells with 7 banded forms, 37 segmented forms, 48 lymphocytes, 5 mononuclears, no typical lymphocytic cells. On the fifth day the white count was 9,800 with 3 banded forms, 23 segmented forms, 70 lymphocytes, 4 mononuclears. At this time the cells were typical of infectious mononucleosis. The Davidsohn test which followed was 1:3,584 presumptive.

Case 3.—J. M., age 22. Admission diagnosis: Catarrhal fever. History: Headaches, sore throat, vomiting for 3 days. Physical examination showed a temperature of 99.6° F.; hyperemia of the pharynx; loud apical systolic murmur, not transmitted; and slight icterus of the sclerae. Course: On the third day the patient was vomiting and showed definite icterus, and the liver was palpable two finger breadths below the costal margin. On the sixth day the temperature was 99.2° F., generalized maculopapular rash with posterior cervical nodes, not tender. The rash was located on the abdomen, chest, buttocks, and forehead. On the eleventh day the temperature was normal and the rash and the icterus had faded. The patient was discharged on the thirtieth day. Laboratory reports on admission: Blood count showed red blood cells, 5,900,000 with 14.5 grams of hemoglobin; white blood cells, 10,600 with 1 juvenile, 24 segmented forms, 72 lymphocytes, and 2 mononuclears; the lymphocytes were typical of infectious

mononucleosis; icteric index was 18.7; cephalin flocculation was 3 plus; and the Davidsohn titre was 1:448.

Case 4.—H. H., age 21. Admission diagnosis: Diagnosis undetermined (medical observation). History: Stuffy nose for 3 days with a "cold" for 2 weeks; nausea and fatigue, 1 day; chills and fever, 4 hours; and watery stools, 3 hours. Physical examination revealed a temperature of 101.8° F.; injection of the pharynx; a grade-3 systolic pulmonic murmur; not transmitted; lymphoid hyperplasia of the pharynx. Course: On the ninth day the patient developed a generalized lymphadenopathy, not tender. On the eleventh day he developed a generalized maculopapular erythematous rash on his entire body, with the exception of the face. On the fourteenth day the rash faded. On the nineteenth day the glands had disappeared. Temperature remained at 99° F. throughout the course until the forty-ninth day. The patient was discharged on the fifty-fourth day. Laboratory reports: Electrocardiogram showed a PR interval of 0.21; sedimentation rate was 3 mm.; red blood cell count was within normal limits, white blood cell count was 6,000 with 1 juvenile, 2 banded forms, 60 segmented forms, 32 lymphocytes, and 4 mononuclears; no typical cells noted; icteric index was 7.8. On the ninth day the patient had 11,650 white cells with 1 juvenile, 2 banded forms, 10 segmented forms, 80 lymphocytes, and 5 mononuclears, with lymphocytic cells typical of infectious mononucleosis. On the thirteenth day the patient had 9,000 white cells, with 85 percent lymphocytes. The Davidsohn titre at that time was reported as presumptive 1:1,792. On discharge electrocardiogram was normal and the blood showed 44 percent lymphocytes.

CONCLUSION

Thirty-five cases of infectious mononucleosis treated at the United States Naval Hospital, Annapolis, Md., from February 1946 through July 1947 have been presented. Four cases with positive signs, symptoms, and laboratory findings have been reported which the authors consider to be typical of this disease of protean manifestations. The most surprising development to the writers in this series was the number of cases (nine, or 25 percent) who showed on admission or during their course petechial lesions on the mucous membranes of the mouth and pharynx. Since the authors set, as an arbitrary standard, a Davidsohn presumptive titer of 1:112 as diagnostic for this particular article before collecting this series of cases, it is felt, in retrospect, that this standard may have been too high, because the writers have certainly had many cases which resembled infectious mononucleosis in which either the Davidsohn titer was below 1:112 or typical cells of infectious mononucleosis were not seen on blood smear examination. Further, because of the number of cases of infectious mononucleosis that have been observed, the disease is probably endemic in this area.

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Infectious Mononucleosis

Report of an Unusual Case

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FOR THE most part the shipboard naval physician is concerned with a large number of so-called routine cases, and for this reason his thinking at times might be considered as channeled. Diseases of the skin, upper respiratory infections, and venereal diseases are such common channels of thought that it is entirely possible for a somewhat obscure or less frequent disease to be overlooked. This is particularly true where one pathological process mimics another.

The following case report demonstrates the ability of infectious mononucleosis to simulate, in its initial complaint at least, one or more of the venereal diseases. Such a simulation brings to those of us aboard ship a forcible realization that we are not too far removed from the variance of hospital or clinic practice and as such we must maintain a high degree of suspicion with regard to all routine cases.

CASE REPORT

B. E. C., a 20-year-old yeoman was seen 5 August 1948, complaining of painful lumps in both groins. These lumps were called to his attention approximately 3 weeks before his appearance in sick bay when the pressure produced by sexual intercourse was experienced as pain in the groins. One and one-half weeks later he noted frontal headaches but ignored them. These headaches were frequent, recurring even at night, and described as similar to the headache of a hang-over. Aspirin was taken for relief. Additional complaints consisted of mild fatigue throughout the day, anorexia for the past 4 days, and one or two episodes of nausea.

The marital history disclosed that the patient's wife was undergoing a routine investigation for tuberculosis, pulmonary, arrested.

The only noteworthy fact in the past history and system review was a gonococcus infection in November 1946, treated with penicillin; no sequellae or coincident penile lesion.

Physical examination revealed a young, well-nourished Caucasian male in no obvious distress. The temperature, pulse, respirations, and blood pressure were within normal limits. The conjunctivae bilaterally were mildly hyperemic. A marked bilateral inguinal adenopathy was found consisting of a large central mass on the right approximately 2 by 4 cm. surrounded by several smaller nodes.

On the left side there was a slightly smaller similar mass with fewer surrounding nodes. These masses were firm and moderately tender to pressure. There was no suggestion of surrounding inflammatory reaction. The masses and nodes were freely movable beneath the skin. Several small nodes were detected in the left cervical area. There were no axillary, tonsillar, right cervical, or epitrochlear nodes palpable. At the base of the penile frenulum within the coronal sulcus was discovered a macular area of hyperemia 2 to 3 mm. in diameter. No other findings were noted throughout the remainder of the physical examination.

The possibility of syphilis, lymphopathia venereum, or disease of the lymphatic system was considered since there was a lack of sufficient evidence to make a definite diagnosis. Immediate (within 6 hours) dark field examinations of the penile lesion were negative. A blood smear revealed a lymphocytosis of 79 percent of which the predominant cell was the large monocyte described (1) as typical of infectious mononucleosis. The total white blood cell count was 14,150; sedimentation rate 10 mm./hr.; and hemoglobin 15.1 gm. The chest roentgenogram was not abnormal. The Kahn test was negative. A diagnosis of infectious mononucleosis was confirmed by a heterophile agglutination reaction (positive 1:224) on 7 August 1948.

Further course of the disease was typical of infectious mononucleosis. On 9 August the spleen was palpated two finger breadths below the left costal margin with the liver enlarged to two to three finger breadths below the right costal margin. Both liver and spleen were tender to pressure. It was thought the inguinal masses were somewhat decreased in size but right cervical and axillary nodes were now palpable, small and nontender.

The white blood cell count on 10 August had risen to 17,850 with an 83 percent lymphocyte count. A repeat Kahn test was negative. By 14 August there was a pronounced decrease in the generalized adenopathy but of all, the most prominent, were the inguinals (approximately 2 by 2 cm.). The liver and spleen after a slight increase in size over the initial observation, had begun to regress with a loss of tenderness. Subjectively the patient was well and at no time since admission was the temperature elevated beyond 99.5° F. orally. A repeat heterophile on 12 August was 1:224.

DISCUSSION

The case presented is of interest primarily because of its initial signs. Infectious mononucleosis such an adenopathy localized to the inguinal area is the exception rather than the rule as shown by a search of the literature, although it is described as occurring as a part of the total lymphatic enlargement (3) (4) (5). Milne (2), in a series of 111 cases, mentions 28 of moderate inguinal enlargement but only 2 with adenopathy of 2 cm, or greater in diameter. This patient was noted to have inguinal masses larger than 2 cm. for almost the entire period of his hospitalization, the masses differentiating themselves into closely associated nodes as they regressed in size.

Of interest secondarily is the observation that the disease appeared to progress from below upward, i. e. 2 to 3 days after admission, cervical and axillary adenopathy, splenomegaly, and hepatomegaly developed in the order mentioned. Regression to normal size was observed first in the nodes, second in the spleen, and finally in the liver.

SUMMARY AND CONCLUSIONS

A case of infectious mononucleosis with an unusual chief complaint and initial signs is presented. Although this case followed the usual course of the disease it is thought that the physician afloat with more limited facilities and the usual frequency of venereal disease in his daily sick call might be led to a diagnosis of syphilis or possibly lymphopathia venereum. The finding of a positive Kahn might confuse even more the true picture.

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Humidity and Allergy

Observations in 150 Cases

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THE otolaryngologist often is called upon to diagnose many vague complaints that tax the physician's acumen and patience. Included among these complaints are vague headaches, recurring colds, persistent rhinorrheas, the low-grade persistent unknown fevers, idiopathic adenopathies, the sensations of aural and nasal stuffiness, vertigo, tinnitus, and a host of other symptoms which, after numerous consultations and exhaustive laboratory studies, are diagnosed as allergic manifestations. Moreover, familiarity with the pathologic changes is an otolaryngological necessity not only for diagnostic purposes but to avoid unnecessary rhinologic, oropharyngeal, and paranasal sinus surgery (1) (2) (3) (4). The following questionnaire was devised to facilitate the evaluation of the total allergic picture. It has been demonstrated that the allergic picture may indicate a multiple allergic response in 70 percent of allergic patients (5) so that a complexity of allergic symptoms should be expected. This multiple allergic interrelationship may frequently be overlooked without a suitable interlocking study system, hence, the value of a correlated outline. The following questionnaire was used routinely on all allergic suspects in the eye, ear, nose, and throat department at the United States Naval Hospital, Memphis, Tenn. When asked, the questions should be simplified and elaborated for complete comprehension by the patient. It is not possible to accept all answers at face value. For example, it was found that patients frequently termed any degree of nasal stuffiness and rhinorrhea a "cold" or, if complicated by headache, a "sinus attack."

History Form ¹

Name.....	Occupation.....
Sex.....	Address.....
Age.....	

¹ Some of the questions are presumptive but are included for completeness.

Present complaint?

Past history :

Same complaint before?

Allergic investigations?

Past illnesses? Frequency of colds?

Hay fever? Asthma? Sinusitis

Operations? Food or drug intolerance?

Where have you had attacks? Frequency?

Time of day?

Seasonal incidence? Spring?

Summer? Autumn? Winter?

Where have you had freedom from attacks?

Any reaction to: Temperature change?

Humidity or dampness? Wind?

Sunlight? Fatigue? Emotional stress?

Neighborhood description? Flora or fauna?

Home description? Furniture?

Bedclothes? Pets?

Habits? Alcohol? Tobacco? Sweets?

Familial:

History of hives? Asthma? Urticaria? Rhinitis?

In: Mother? Father? Both? Siblings? Grandparents?

Systemic history:

Skin: Have you ever had hives, infantile eczema, urticaria, itching, burning, purpura, poison ivy or oak?

Mouth:

Have you had:

1. Swelling of the lips?
2. Canker sores? Gingivitis?
3. Itching of palate?

Nasopharynx:

Have you or have you had:

1. Itching or dryness of palate?
2. Postnasal drip?
3. Frequent pharyngitis?
4. Frequent tonsillitis?

Larynx:

Have you or have you had:

1. Frequent laryngitis?

Lung:

Have you or have you had:

1. Chest wheezing?
2. "Rattling" in the chest?
3. Dyspnea?
4. Tightness in the chest?
5. Cough? (Relationship to 1-4)

Cardiovascular:

Have you or have you had:

1. Hypotention?
2. Hypertension?
3. Cardiac irregularities?

Gastro-Intestinal:

Have you or have you had:

1. Frequent spasms and belching?
2. Frequent attacks of indigestion?
3. Frequent attacks of abdominal pain?
4. Frequent attacks of constipation?
5. Frequent attacks of diarrhea?
6. Colitis?

Brain:

Have you or have you had:

1. Hemicrania?
2. Associated with nausea? or
3. Flashes of light? or
4. Paresthesias? or
5. Ringing in the ears?
6. Describe your headache.

Eyes:

Have you had:

1. Urticaria of the lids?
2. Blepharitis?
3. Conjunctivitis?

Describe.

Genito-urinary:

Do you have:

1. Nocturia?
2. Enuresis?
3. Bladder irritation?

Joints:

Have you:

1. Joint pains?
2. Swelling of joints?

A complete physical and otorhinolaryngic examination was done on all allergic suspects. Laboratory examinations consisted of routine studies—skin tests in many cases, roentgenograms, studies of bronchoscopic aspirations when indicated, and routine cytologic studies of nasal secretions. The secretions were removed from the inferior and middle meatus, placed gently on a slide (in order to avoid cell distortion) and stained, and examined. A quick check usually suffices and an actual count is not necessary because normal nasal secretions contain few cells (6) and even the presence of a few polymorphonuclears in the secretions is not considered significant. The writer considers a 10-percent eosinophile count and above positive. Eosinophile

clumping was considered very positive and this is in accord with Hansel's concepts (7). Rappaport (8) states that eosinophiles may not be seen initially in allergic rhinitis since it takes 10 to 14 days for them to develop in the bone marrow and, thereafter, they may be present in the shock tissue. Negative smears, therefore, were repeated three or four times a month. The nasal smear is also significant in the differential diagnosis of allergy and infection (9) (10) (11), and some authorities say that no rhinologic examination is complete without one. Nevertheless, it is conceded that the cytologic study of nasal secretions is extremely important. Skin tests, however, were disappointing in most cases in this series.

Observations of 150 consecutive allergic cases were interesting. First, it was noted that positive allergic histories were more frequent in children up to 15 years of age than in adults. Comparison of age groups as related to combined allergic histories, one-parent allergic histories, and negative histories were as follows: 150 patients, 82 under 15 and 68 over 15 years of age; 23 patients (15.2 percent) had combined parent histories, 20 patients (13.2 percent) under 15 and 2 percent over 15 years of age. One-parent histories were elicited in 83 patients (55.4 percent), 50 patients (33.4 percent) under 15 and 33 (22 percent) over 15 years of age; 44 patients (29 percent) had negative histories, 12 patients (8 percent) under 15 and 32 (21.4 percent) over 15 years of age.

Further break-down in age groups is shown in table 1:

TABLE 1

Age	Combined history	One-parent history	Negative history
1½ to 23 months.....	6	19	3
2 to 4 years.....	6	14	5
5 to 9 years.....	6	11	3
10 to 14 years.....	2	6	1
15 to 20 years.....	0	6	4
21 to 30 years.....	2	11	12
31 to 40 years.....	0	10	11
Over 40 years.....	1	6	5

This is illustrated graphically in figure 1.

Cooke (12) has shown that allergy is inherited as a Mendelian dominant characteristic. In families where both parents were allergic (combined allergic history), three out of four children would develop a clinical form of allergy; and when one parent was allergic, one-half the children had allergic tendencies. A positive allergic family history is important and should stimulate the clinician to further investigate allergic possibilities in that individual.

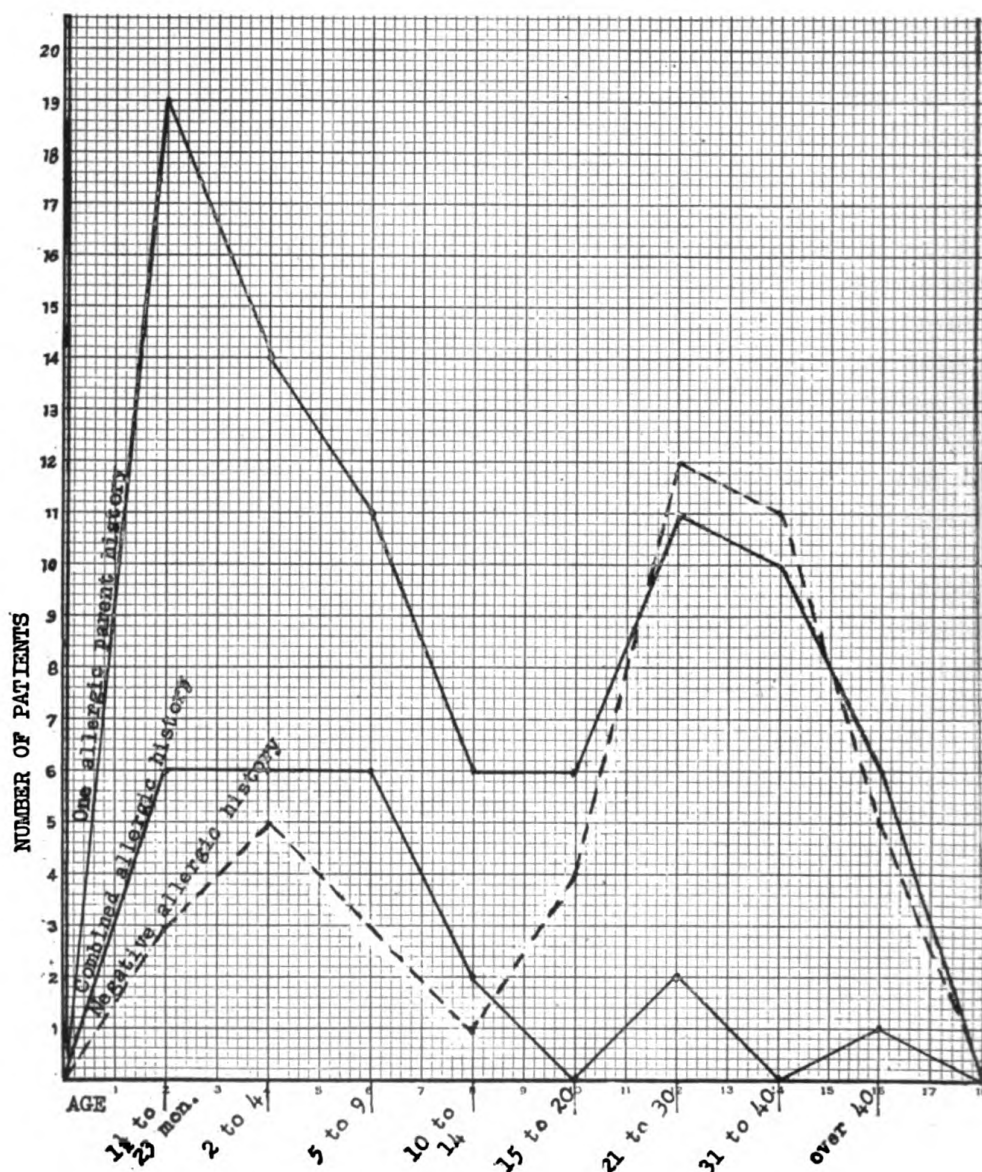


Figure 1.

In this series of cases, the usual otolaryngological allergic manifestations were represented, such as seasonal allergic rhinitis (weeds, grasses, trees), perennial allergic rhinitis, bronchial asthma, and vasomotor rhinitis.

Three unusual cases were presented:

(1) A case of allergy of the right parotid gland in a 3-year-old male. The gland, prominent and painless, was the size of a small walnut. It remained enlarged for 2 months and cytologic study of the secretions obtained at the mouth of Stenson's duct indicated a predominance of eosinophiles. Feinberg (13) states that these cases occasionally occur from iodide administration; however, the only iodides ingested were

from the routine use of iodized salt in cooking. Pearson (14) originally reported this phenomenon as a true allergy on the basis of certain food sensitivity and stated the essential pathology was due to duct obstruction.

(2) The second case occurred in a 6-year-old egg-allergic male who had monthly attacks of rhinorrhea and who suddenly developed large areas of generalized subcutaneous purpura combined with large urticarial wheals.

(3) The third case was that of a 6-year-old female who had a persistent daily rise in temperature, cardiac irregularity, frequent episodes of epistaxis and rhinitis, and an elevated sedimentation rate. The child was at first thought to have atypical rheumatic fever, but repeated cytologic studies of the nasal secretions indicated an eosinophile preponderance, and a 5-day clinical trial with palliative antihistaminic drugs produced a symptom-free interval. The exact antigen was not discovered, but an infected, obstructing adenoid mass (visualized on posterior rhinoscopy) was believed to be the precipitating factor. Adenoidectomy was performed. The child has so far remained well.

A tabulated comparison was made as to the number of major allergic attacks and where they occurred. The results indicated in table 2 are relative. The figure for Arkansas is small and is represented by four Army patients (no naval personnel in this series had lived in Arkansas). One would expect the figure for Tennessee to be higher, because of patients actively seeking medical aid, yet we have no data on patients whose symptoms abated since coming here. Eighty persons had allergic attacks in Tennessee and other States; 52 patients had initial allergic attacks in this Mississippi Valley area; and 28 of these patients stated that their attacks were related to climatic conditions. Typical complaints were: "Damp weather makes my nose stuffy and my breathing heavy," or "Rainy weather causes my nose and ears to feel blocked." The greatest number of complaints referable to environment were associated with moisture, dampness, and temperature change in relation to nasal, bronchial, and aural symptoms. Eighteen persons had similar continuous complaints which originated in Corpus Christi, Tex.; Jacksonville, Fla.; southern California; and Little Rock, Ark. Their complaints did not abate upon being transferred to this area. These patients were likewise susceptible to weather changes and particularly humidity. They also conformed to Thacker's (15) criteria for vasomotor rhinitis (negative allergic history and negative laboratory studies, having nasal congestion for 1 year or more with little or no secretion). A comparison of these five States was made in regard to their relative humidities and average temperatures (table 3). Note that all the readings indi-

cate considerable moisture in the air. The Mississippi Valley readings (Memphis and Little Rock) and Long Beach, Calif., indicate rather sharp fluctuations between morning and evening humidity readings.

TABLE 2.—*States where attacks occurred and number of attacks in each*

Arkansas.....	9	New York.....	3
California.....	30	New Jersey.....	1
Connecticut.....	1	North Carolina.....	5
District of Columbia.....	4	Ohio.....	1
Florida.....	29	Oklahoma.....	1
Georgia.....	3	Oregon.....	2
Illinois.....	6	Pennsylvania.....	4
Indiana.....	6	Rhode Island.....	4
Kansas.....	1	South Carolina.....	2
Louisiana.....	7	South Dakota.....	1
Maryland.....	1	Tennessee.....	121
Maine.....	1	Texas (Corpus Christi).....	51
Massachusetts.....	2	Virginia.....	6
Michigan.....	5	Washington.....	3
Mississippi.....	1	Wisconsin.....	3
Missouri.....	2		
Hawaii.....			7
W. Pacific.....			3

NOTE.—There was a total of 326 attacks of which 121 attacks occurred in Tennessee. There was a total of 150 patients, of which 52 had attacks in the Mississippi Valley only, 80 had attacks in Tennessee and other States, and 18 patients (from Arkansas, California, Florida, and Texas) had continued attacks.

Table 3.—*U. S. Weather Bureau statistics ¹—Humidity comparisons*

City and State	Year	Average relative humidity	Average temperature	Percent possible sunshine
		<i>Percent</i>	<i>Degrees</i>	<i>Percent</i>
Memphis, Tenn.....	1947	{ 7 a. m. 83 7 p. m. 62 }	61.4	67
Little Rock, Ark.....	1946	{ 7 a. m. 81 7 p. m. 61 }	63.4	60
Long Beach, Calif.....	1941	{ 7 a. m. 74 7 p. m. 55 }	64.0	70
Jacksonville, Fla.....	1947	{ 7 a. m. 87 7 p. m. 74 }	69.8	57
Corpus Christi, Tex.....	1947	{ 7 a. m. 87 7 p. m. 79 }	69.0	58

¹ Latest available information at Memphis Weather Bureau.

It is difficult to determine to what extent climatic conditions exert in allergic manifestations. Swineford (16) in a study of physical allergy found that 201 of 325 patients attributed an appreciable amount of difficulty to physical agents more than any group of material agents. Rosedale (17) objectively studied the histopathology of maxillary sinus mucosa in rabbits in relation to various combinations of temperature and humidity. He found that in temperatures of 82° F. and a relative humidity of 73 percent (warm and wet) there

was more free exudate and loss of goblet cells than in "cold and dry" and "cold and wet" environments. He noticed there was also a tendency toward chronicity and a thickening of the basement membrane and hyperplasia of epithelium. He further stated that the hot and dry environments (90°F. and 12 percent relative humidity) caused varied degrees of sinusitis, whereas cool and dry atmospheres (70° F. and 50 percent relative humidity) were the most beneficial. Lederer (18) states that every physiologic adjustment that is induced by weather alteration is apt to find reflection in any region of the body that is inadequate. This expresses itself either in unusual symptoms, in change of function, or in actual lesions in the various organs of the body. Duke (19) has shown that manifestations of physical allergy (abnormal responses to environment) are due to a disturbance of the heat-regulating mechanism, and Cone (20) found that the temperature of the normal nasal mucosa was 32.0° C. (89.6° F.) whereas the allergic nasal mucosa was 31.1° C. (87.9° F.). Surely, in all allergic cases, it is difficult to dissociate external temperature and humidity as contributing factors. In the Navy the study of the allergic personality and his relationship to changing environments is both interesting and important and offers unlimited possibilities for study. Failure to recognize allergy (clinical and subclinical) as such, and especially those cases of nonallergic hypersensitiveness, may result in the persistence of otorhinolaryngological and related symptoms in sincere patients.

SUMMARY AND CONCLUSIONS

1. An allergic history outline correlating the important shock tissues has been presented.
2. Diagnostic observations of 150 consecutive cases have been presented.
3. Humidity per se plays a part in the initiation and severity of allergic reactions and especially in those cases of altered organism reactivity.

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The Naval Personal Inventory and the Naval Offender

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THOSE acquainted with criminology are cognizant of the numerous studies of delinquent groups that have been published with various "personality scales" and the varying degrees of success in predicting antisocial behavior by means of these scales (1) (2) (3) (4) (5) (6). The present research consists of a preliminary attempt to evaluate 1,239 Navy court-martial prisoners with the naval enlisted personal inventory and to determine the extent to which this inventory might be used in pointing out those individuals who may become disciplinary problems through some psychopathological pattern.

The naval enlisted personal inventory consists of two parts, one of which is an abbreviation of the Cornell selectee index, and the other a short form of the Shipley inventory. The description of the purpose of the naval personal inventory is quoted:

Scoring and interpretation.—This instrument is designed to select that portion of the population for whom psychiatric investigation is most strongly indicated. It should not be used for "cutting" or eliminating personnel independently of psychiatric confirmation. Individuals scoring above certain levels on either part should be referred for psychiatric interview. If all individuals in the population are routinely examined, then individuals scoring above the prescribed levels would warrant more intensive investigation than the remainder.

It should be noted that the "investigating scores" are merely tentative and vary for different service groups. Individuals score *at or above* the levels indicated below should be considered for psychiatric referral. A further report on the use and interpretation of the inventory will be issued in the near future.

Investigating scores

	<i>For amphibious personnel</i>	<i>For submarine personnel</i>
Part 1-----	10 or above	8 or above.
Part 2-----	1 or above	1 or above. ¹

¹ Manual for Navy Enlisted Personal Inventory, Form 2. (January 1945) p. 1.

This scale was given to 1,239 unselected individuals at a naval disciplinary barracks. The group was made up of 1,121 white men and 118 Negroes. Of the total, 243 were awaiting trial and 996 were serving sentences of general court martial. Those serving sentences were further categorized into groups which were ultimately to be discharged with a bad-conduct or dishonorable discharge and those who were to go back to duty after serving their sentences.

Scores for each of the groups on part 1 of the inventory are given in table 1. A statistical break-down of these findings as presented in table 2 reveals that if a score of 8 were to be used as the cutting point for further examination 50.2 percent of the total group would fall in this category. The scores for each of the subgroupings are fairly similar and the differences are not statistically significant, with the exception of the difference between the whites and Negroes. The difference here is 14.8 percent in those checking eight or more questions and the standard error of the difference is 0.047. The critical ratio therefore is 3.1 and the chances are better than 99.9 out of 100 that this difference is statistically significant. In considering the reliability of the sampling it is found that the chances are better than 99.9 out of 100 that in none of the groups would the true percentage fall below 41.

TABLE 1.—*Distribution of scores on part 1, Navy enlisted personal inventory*

Score	Awaiting trial	Bad-conduct or dishonorable discharge	Back to duty	Total group	Negro	White
0.....	5	2	9	16	0	16
1.....	14	11	36	61	1	60
2.....	10	25	49	84	5	79
3.....	11	26	65	102	11	91
4.....	18	24	55	97	5	92
5.....	13	22	46	81	5	76
6.....	16	21	39	76	4	72
7.....	24	22	54	100	12	88
8.....	14	17	49	80	12	68
9.....	13	18	37	68	9	59
10.....	19	21	50	90	3	87
11.....	18	22	38	78	10	68
12.....	13	14	40	67	8	59
13.....	13	20	29	62	9	53
14.....	8	15	39	62	7	55
15.....	13	9	25	47	10	37
16.....	11	7	16	34	3	31
17.....	5	5	8	18	3	15
18.....	1	2	7	10	0	10
19.....	4	0	2	6	1	5
20.....	0	0	0	0	0	0
Total.....	243	303	693	1,239	118	1,121

The writers must assume from this that approximately one out of every two men entering the brig scores sufficiently high to warrant being picked out for special study. Although norms for the general Navy population are not available to the writers at this time it is apparent that this figure is high.

TABLE 2.—*Individuals checking 8 or more significant questions of part 1*

	Awaiting trial	Bad-conduct or dishonorable discharge	Back to duty	Total group	Negro	White
1. Total number of cases.....	243	303	693	1,239	118	1,121
2. Number of cases checking 8 or more significant questions.....	132	150	340	622	75	547
3. Percent of total checking 8 or more questions.....	54.3	49.6	49.1	50.2	63.6	48.8
4. Standard error of percentage.....	.043	.028	.019	.014	.044	.014
5. Average number of significant questions checked.....	8.5	7.8	7.8	7.9	9.2	7.8
6. Standard deviation of mean.....	4.8	5.0	4.8	5.4	4.5	4.7

Item 5 of table 2 gives the average number of significant questions checked by each of the groups. Here again the number for the Negro group is somewhat higher than for the white.

Table 3 gives the distribution of scores on the critical or "stop" questions of part 2 of the inventory for the same groups. Breaking this down statistically in table 4, the authors find that from 57.2 to 89.0 percent of the individual groups have checked at least one critical "stop" question, with the average for the total population studied being 77.6 percent. Here, as might be expected from part 1, there is a marked and statistically significant difference between the Negroes and whites, the relative percentages being 89.0 and 76.4, respectively. However, another difference, which was not expected on the basis of part 1 (and which the writers are at a loss to explain at this time) was the score made by the group awaiting trial. Only 57.2 of the individuals in this group checked a significant answer as compared to 78.9, 76.3, and 77.6 percent for those to be discharged, those serving sentences and the total group, respectively.

TABLE 3.—*Distribution of scores on "stop" questions—part 2, Navy personal inventory*

Score	Awaiting trial	Bad-conduct or dishonorable discharge	Back to duty	Total group	Negro	White
0.....	50	64	164	278	13	265
1.....	66	69	149	284	23	261
2.....	40	52	129	221	16	205
3.....	30	45	84	159	10	149
4.....	20	35	64	119	17	102
5.....	16	12	43	71	8	63
6.....	12	9	28	49	13	36
7.....	5	6	10	21	7	14
8.....	0	6	11	17	2	15
9.....	0	1	5	6	2	4
10.....	1	2	4	7	4	3
11.....	0	1	0	1	0	1
12.....	0	1	0	1	1	0
13.....	2	0	2	4	1	3
14.....	1	0	0	1	1	0
15.....	0	0	0	0	0	0
16.....	0	0	0	0	0	0
Total.....	243	303	693	1,239	118	1,121

TABLE 4.—*Individuals checking 1 or more "stop questions" on part 2*

	Awaiting trial	Bad-conduct or dishonorable discharge	Back to duty	Total group	Negro	White
1. Total number of cases	243	303	693	1,239	118	1,121
2. Number of cases checking 1 or more stop questions	139	239	529	961	105	856
3. Percent of total checking 1 or more questions	57.2	78.9	76.3	77.6	89.0	76.4
4. Standard error of percentage . . . . .	.032	.023	.016	.012	.029	.010
5. Average number "stop questions" checked	2.3	2.3	2.3	2.3	3.7	2.1
6. Standard deviation of mean	2.3	2.3	2.3	2.3	3.1	2.2

Considering the reliability of the sampling again it was found that if the entire group of naval offenders were to be studied the percentage of the total group would fall between 71.5 and 81.1. In the light of these findings it appears that approximately three out of every four individuals coming to a Navy brig would have been selected by part 2 of the naval enlisted personal inventory for special study. Here again the norms are not available for comparison, but it is quite obvious that the findings are high enough to merit consideration.

Table 5 presents the distribution of answers to all of the questions of part 2 of the inventory, including the noncritical as well as the critical questions. Since, at the moment, the writers have no basis for comparison they are presented in order that those nonbrig activities which may have built up some norms may use them as a check in validation.

TABLE 5.—*Item analysis—Part 2—200 unselected cases*

Question No.	Cases	Question No.	Cases
1	79	17	51
2	115	18	52
3	73	19	87
4	58	20	99
5	75	21	41
6	78	22	60
7	76	23	102
8	76	24	16
9	66	25	61
10	15	26	10
11	18	27	9
12	18	28	10
13	16	29	27
14	50	30	19
15	23	31	15
16	7	32	51

Table 6 presents an analysis of the responses of 200 brig inmates to the 32 questions of part 2. From this it is observed that the non-critical complaints most frequently checked are:

Question No.	Cases
2. Are you easily upset or irritated?.....	115
5. Do you have the feeling of being watched while you are at work?.....	75
6. Do you often have pressure or pains in the head?.....	78
7. Do you often have spells of dizziness?.....	76
8. Do you often shake or tremble?.....	76
19. Do you often have difficulty in falling asleep or staying asleep?.....	87
20. Do you sometimes have nightmares?.....	90
23. Do you get spells of exhaustion or tiredness?.....	102

Similarly, the critical questions that are most heavily weighted are:

Question No.	Cases
9. Do you suffer badly from frequent severe headaches?.....	66
10. Have you ever vomited blood?.....	50
25. Have you suffered from severe long-lasting pains in the stomach that have been relieved by food?.....	61
32. Do you drink more than 2 quarts of whisky a week?.....	51

TABLE 6.—Distribution to total "yes" answers part 2, Navy personal inventory

Score	Awaiting trial	Bad-conduct or dishonorable discharge	Back to duty	Total group	Negro	White
0	22	25	61	108	3	105
1	6	15	60	81	6	75
2	12	26	36	74	3	71
3	15	18	42	75	9	66
4	11	15	35	61	4	57
5	13	13	40	66	3	63
6	13	20	44	77	8	69
7	15	15	19	49	7	42
8	7	19	45	71	8	63
9	22	16	33	71	8	63
10	14	21	34	69	5	64
11	7	14	30	51	7	44
12	14	18	27	59	4	55
13	14	9	33	56	5	51
14	13	15	30	58	4	54
15	14	10	21	45	4	41
16	7	5	28	40	1	39
17	7	5	26	38	6	32
18	3	11	12	26	8	18
19	2	2	11	15	1	14
20	1	2	6	9	3	6
21	5	4	8	17	3	14
22	1	1	4	6	3	3
23	1	4	3	8	2	6
24	0	0	1	1	1	0
25	2	0	1	3	0	3
26	0	0	2	2	1	1
27	1	0	1	2	0	2
28	1	0	0	1	1	0
29	0	0	0	0	0	0
30	0	0	0	0	0	0
31	0	0	0	0	0	0
32	0	0	0	0	0	0
Total.....	243	303	693	1,239	118	1,121

Table 7 presents the psychiatric impressions on 100 unselected cases scoring 8 or above on part 1 of the naval personal inventory. These impressions were obtained from the men's records and were written prior to the administration of the inventory. If we include straight

behavior disorders (classed as "undisciplined") in the positive findings we note that 90 percent of the cases have been classified as not being psychiatrically negative. When one compares this with the results obtained for 100 individuals who scored below 8 (table 8) we find a striking contrast. Here, if the "undisciplined" classification is included again we find that only 55 percent show some psychiatric aberration as compared to the 90 percent in the other group.

TABLE 7.—*Psychiatric diagnosis on 100 unselected cases scoring 8 or above on part 1*

<i>Diagnosis</i>	<i>Case</i>
Negative.....	10
Undisciplined.....	12
Immature.....	12
Constitutional psychopathic states:	
Inadequate personality.....	15
Emotional instability.....	14
Criminalism.....	4
Borderline intelligence.....	4
Psychoneurosis.....	14
Combat fatigue.....	2
Chronic alcoholism.....	8
Neurological disorders.....	4
Schizoid personality.....	1
Total.....	100

TABLE 8.—*Psychiatric diagnosis in 100 unselected cases scoring below 8 on part 1*

<i>Diagnosis</i>	<i>Case</i>
Negative.....	45
Undisciplined.....	11
Immature.....	18
Constitutional psychopathic states:	
Inadequate personality.....	8
Emotional instability.....	9
Criminalism.....	3
Borderline intelligence.....	4
Psychoneurosis.....	1
Chronic alcoholism.....	1
Total.....	100

Although a cutting score of 8 gives only 10 percent false positives it does miss a considerable portion of true positives in the group studied, and the writers plan to investigate this point further.

An attempt at prognosticating the number of previous offenses (exclusive of captain's masts) by means of scores on part 1 of the inventory proved valueless, as is indicated in tables 9 and 10. The average number of offenses for those scoring below 8 is 1.45 as compared to 1.54 for those scoring above 8. The difference between the two means is not statistically significant.

TABLE 9.—*Previous courts martial in 100 unselected cases scoring 8 or above on part 1*

Number of Courts:	Cases	Number of Courts:	Cases
0	29	6	0
1	20	7	1
2	27		
3	16	Total	100
4	5	Mean	1.54
5	1		

TABLE 10.—*Previous courts martial in 100 unselected cases scoring below 8 on part 1*

Number of Courts:	Cases	Number of Courts:	Cases
0	27	5	2
1	35	6	1
2	15		
3	16	Total	100
4	4	Mean	1.45

SUMMARY AND CONCLUSIONS

The present investigation has attempted to evaluate the naval enlisted personal inventory as a tool in predicting naval delinquencies. Employing the suggested "cutting" scores of 8 for part 1 and 1 for part 2 we have found that part 1 alone would pick out 50.2 percent for investigation.

Statistically reliable differences were found between the whites and Negroes and both portions of the scale, the Negroes scoring considerably higher on both portions.

A statistically significant difference was found between those awaiting trial and those serving sentence on part 2 of the inventory but not on part 1. This difference has not been explained.

High scores on part 2 of the inventory were validated by check against psychiatric examination.

The scale does not serve as an aid in predicting number of naval offenses.

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Angioid Streaks of the Retina

Report of a Case

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THE reporting of an unusual type of atrophy or degeneration of the retina in a journal which is intended to be of primary interest to the nonspecializing medical officer may appear to have questionable value. However, the condition presents a characteristic fundus picture with no clinical symptoms and it could readily be recognized in a routine ophthalmoscopic examination of the retina if it were kept in mind.

CASE REPORT

W. E., a 29-year-old colored male, was first seen on 10 April 1947 complaining of the sensation of a lump in his throat. Examination at that time revealed a large ulcerated tumor on the posterior wall of the oropharynx. The patient was also found to have bilaterally enlarged, apparently chronically infected tonsils and small yellowish-white patches on the buccal mucosa which had the appearance of Fox-Fordyce disease. A routine examination of the eyes revealed vision of 20/20 in each eye, normal external segments, and clear media. The ocular fundi revealed well developed angioid streaks bilaterally.

Biopsy of the tumor in the oropharynx proved it to be grade II epidermoid carcinoma. Surgery was performed removing the entire area in one block. Subsequent examinations have failed to reveal any evidence of a local recurrence or of regional lymph node invasion.

A specimen of the buccal mucosal lesions was taken for biopsy at a later date because of their resemblance to the rare mucosal lesions of pseudoxanthoma elasticum, and the diagnosis of Fox-Fordyce disease was established.

Reexamination of the ocular fundi in January 1948, when the patient returned to the hospital for follow-up examination and tonsillectomy, showed no apparent change in the appearance of the angioid streaks since the first examination. Physical examination failed to reveal any evidence of skin lesions typical of pseudoxanthoma elasticum. A complete series of roentgenograms of all bones was entirely negative for evidence of Paget's disease. The lesions of angioid streaks have been reported in Paget's disease, and for this reason it was felt that it should be eliminated as a possibility.

The diagnosis of angioid streaks is made on the typical ophthalmoscopic picture. This consists of a more or less complete pigmented ring surrounding the optic disk with pigmented irregular streaks

extending from this ring out toward the periphery. It is described rather graphically by Duke Elder (4) as "suggesting swept up accumulations of pigmentary debris or a line of wrack on the seashore." The streaks vary considerably in color from dark red through brown to black. They lie deep to the retinal vessels, between them and the choroidal vessels. Both eyes are almost invariably involved.

Most pathologists include the condition known as angioid streaks in the general category of degenerative disease of the retina along with such other conditions as pigmentary degenerations, lipoid degenerations, and dysostosis multiplex. The etiology and the pathology of the disease are clouded in uncertainty, many theories having been advanced to explain them. According to Groenblad (8) the principal theories are four in number:

(1) The streaks are "products of the metamorphosis of hemorrhage."

Some believe that the angioid streaks are produced by the deposition of hematogenous pigment, derived from the repeated sub-choroidal hemorrhages in the perivascular spaces of the short ciliary arteries of the circle of Zinn and the branches proceeding from it (2). Groenblad (8) believes that the hemorrhages follow rather than precede the development of the angioid streaks.

(2) The streaks represent anomalous or newly formed blood vessels. Some hold that angioid streaks "represent an anomalous arterial circle around the optic disk" (2).

(3) The streaks represent folds in the retina or choroid "on the basis of primary pathology resulting in secondary formation of folds" (2). Verhoeff (12) claimed that histopathological examination of a case of angioid streaks showed them to be "ridges comprising the inner layers of the choroid, produced by cicatricial contraction of fibrous tissue which has replaced the deeper layers."

(4) The streaks represented ruptures of the various layers of the retina or choroid. Some consider the streaks to be ruptures in the lamina elastica or lamina vitrea (Bruch's membrane) of the choroid. Hagedoorn (9), in studying two eyes with clinical angioid streaks, found many changes in the histopathological picture, but one abnormality was a constant and dominating feature—"the pathologic condition of Bruch's membrane" which he found to be considerably thickened and stained excessively with hematoxylin. Also there were present a great many clear-cut defects in Bruch's membrane, most marked in the region of the optic disk. These he considered to be tears in the membrane. Hagedoorn concludes that "in angioid streaks a specific degeneration of the elastic system occurs at a time when other cells and tissues of the body still are in good condition."

Although both angioid streaks and pseudoxanthoma elasticum had been described much earlier, the streaks being first recognized by

Doyle in 1889, it was not until 1929 that Groenblad called attention to the frequent occurrence of both diseases together, the so-called Groenblad-Strandberg syndrome.

Pseudoxanthoma elasticum may be briefly described as "degenerative changes in the elastic tissue in the middle and deeper portions of the cutis" (1).

In October 1941 Scholz (11) reviewed the literature and collected a total of 188 cases of angioid streaks; of these, 6 were in Negroes, 6 in Japanese, and the remainder in whites; 58 percent were in males; and the age incidence peak was in the fifth decade.

Among 139 cases reported since 1929, pseudoxanthoma elasticum was found in 59 percent of the cases and only specifically stated to be absent in 13 percent of the cases.

According to the present-day concept of the disease, the most likely explanation for their appearance together is that this is a generalized systemic disease which causes a break-down or degeneration of the elastic tissue in many parts of the body, manifested most ostensibly in the skin and the eye. Bruch's membrane is partially composed of elastic tissue and the middle layer of the skin is constituted of elastic tissue in the main. Changes also occur in the vascular tree with degeneration of the elastic fibers in the arterial walls. With such weakening of Bruch's membrane, ruptures occur and with weakened arterial walls hemorrhages occur in the eye and elsewhere in the body, but most readily demonstrable as intraocular hemorrhages. If the condition continues to progress the hemorrhages become more and more frequent and give rise to progressively damaging lesions and eventually involve the macula. Since it is likely that few, if any, symptoms will be experienced by the patient until the macula is involved, it probably explains the frequent occurrence (in 50 percent of cases according to Duke Elder) of angioid streaks in conjunction with serious macular lesions.

This hypothesized break-down of Bruch's membrane is borne out in several histologic sections studied by Hagedoorn which showed that the lamina elastica of Bruch's membrane had undergone degenerative changes which had resulted in a change in the staining characteristics, thickening of some parts, thinning of some parts, and atrophy in other parts to the point of hole formation.

As to the cause of the generalized break-down of the elastic tissue, it seems most likely that both angioid streaks and pseudoxanthoma elastica are simply "manifestations of a familiar instability of the elastic tissue of the body" (2).

In a consideration of the prognosis of the disease, most authors are agreed that the striae in themselves are entirely symptomless, but in

view of their frequent association with more serious lesions such as hemorrhages, colloid degeneration, areas of choroidal atrophy, exudative choroidal masses, and diskiform submacular degeneration, the prognosis should be guarded. In Scholz's review of 188 cases, of those that had been examined for 1 year or longer, 33 percent showed an increase in the number of angioid streaks, 10 percent showed a decrease, and 56 percent remained unchanged.

All attempts at treatment have been very discouraging with no consistently good results. Treatment has been aimed at amelioration of the associated hemorrhages and degenerative complications by the use of calcium, vitamins B and C. Gold injections have been tried with questionable results.

SUMMARY

A case of angioid streaks of the retina has been presented because of its rarity and its varied and apparently unrelated associated clinical findings. At the time of this writing no evidence of pseudoxanthoma elasticum has appeared in the patient. Lesions in the mouth similar to pseudoxanthoma elasticum proved to be Fox-Fordyce disease. Roentgenograms failed to give any evidence of bony changes suggestive of Paget's disease, which is sometimes an associated finding.

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Cryptococcus Meningitis

Report of a Case

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ACCORDING to Freeman (1) infection of the central nervous system by yeastlike organisms was first described by Von Hauseman in 1906. In 1916 Stoddard and Cutler (2) reported two cases, discussing cultural characteristics, pathogenicity for animals, and differentiating this infection from blastomycosis and and coccidioidal granuloma. Since that time an increasing number of cases have been reported, probably as a result of increased consciousness of the existence of this disease by the medical profession. There can be little doubt that many cases before and since the original report have been misdiagnosed, as the differential diagnosis is not always simple. Frequently the first suspicion of the disease occurs at time of autopsy. However, in recent years there appears to be a substantial increase in the number of antemortem diagnoses.

The most complete review of the literature is that by Levin (3) in 1937, who reviewed a total of 60 cases. According to this report 30. or 50 percent, of the cases were confined to the central nervous system alone; 9 (15 percent) were associated with pulmonary lesions only, and 8 (13 percent) with generalized systemic infection. Other organs reported involved along with the central nervous system are the kidney, spleen, adrenal, abdominal lymph nodes, peribronchial lymph nodes, tonsils, subcutaneous tissue, skin, thyroid, bone marrow, and prostate. Freeman (1) however, claimed noninvolvement of the skin as a primary lesion and used this criterion to differentiate cryptococcus infection from infections with other fungi. Mitchell (4), in 1936, called attention to the association of cryptococcus infection and Hodgkin's disease, pointing out the similarity of the clinical manifestations and the histologic appearance of these diseases.

The pathologic change noted in the central nervous system may be confined to the leptomeninges. However in most cases the parenchyma of the brain and spinal cord are usually involved. Involvement of the gasserian ganglion has been noted in a few cases. The

degree of involvement of the meninges is varied. Sometimes only a few nodules up to 3 mm. in diameter are noted. In more advanced cases there may be diffuse thickening of the meninges with a strong resemblance to tuberculosis.

In the brain the process is usually manifest in the form of cysts of the gray matter. These vary in number and size with individual cases. Occasionally the entire cortex is riddled with cysts producing the so-called "soap suds" appearance. Caseation and abscess formation have not been observed.

When the lungs are involved, granulomatous masses varying in number and size are seen. The process may take the form of small tuberclelike masses, the larger of which may have necrotic centers. When the process is seen in other organs it is similar to that observed in the lungs. The histologic picture varies according to the organ involved. In the central nervous system the similarity to syphilis may be quite marked. Here the lesions are of a granulomatous nature resembling gumma. Cysts due to direct invasion of organisms are usually seen along the perivascular spaces, producing bottleneck-shaped cystic spaces. The causative organism is usually present in large numbers. In the lungs and other organs, the picture is one of fibrosis and chronic inflammatory reaction. Here as in the central nervous system, the diagnosis is confirmed by finding the causative organism.

Formerly the term torulosis was used for this disease, in accordance with the original report. In recent years the term cryptococcus infection has been used. The term cryptococcus appears to be the most suitable designation. It will be indicated below that it is the authors' opinion that any one of several strains of yeastlike organisms may be capable of producing the disease entity.

The majority of cases of cryptococcus infections reported in the literature have been from this country. In January 1943 Blair (5) reviewed the literature in England, and reported the third case in that country. Sporadic cases have been reported from Germany and other continental areas.

Most cases reported have had a fatal termination. A few authors recently have reported isolated cases of recovery or remission. In view of the fact that the disease runs a chronic course, any report of recovery must be viewed with considerable skepticism.

CASE REPORT

P. G., male, age 49, was admitted to the sick list 26 May 1944 with the chief complaints of a fainting spell and vomiting. On admission he stated he had been in good health until the day before, when, while standing at attention, he suddenly lost consciousness for a brief period. He reported to sick bay a few hours later with a temperature of 102° F. His only other complaint was a slight cough

and pain in the lower left chest with occasional periods of vertigo. Physical examination at that time was essentially negative. He remained in bed until 8 June 1944 when he was admitted to the hospital. During the 2-week interim he continued to complain of weakness, bouts of vomiting, impaired memory, and episodes of vertigo on changing the position of the head. He continued to have an intermittent type of fever with temperatures up to 102° F. Two days before admission muscular twitchings and a coarse tremor of the hands were observed.

He was admitted to the hospital when a neurologic examination showed stiffness of neck, nystagmus, past pointing, and exaggerated unequal knee jerks. Physical examination at this time revealed a middle-aged male adult who appeared acutely ill. Sensorium was clouded and there was some degree of disorientation. The mucous membranes were dry, pharynx slightly reddened, and tongue coated. Examination of lungs, heart, and abdomen were negative. Knee jerks and biceps reflexes were unequal and exaggerated. Brudzinski's and Kernig's signs were positive. Babinski's sign was negative. There was marked nuchal rigidity, but no evidence of opisthotonos. A spinal puncture done soon after admission showed clear fluid under no increased pressure. The cell count 10,000 per cm. practically all lymphocytes. Direct examination of the fluid revealed a large number of small spherical bodies, many of which were in stages of budding. These were recognized as belonging to the cryptococcus group. Fluid culture showed an organism, morphologically and culturally characteristic as indicated later in this report. The Pandy test was positive, sugar 58.7 mg. percent, and total protein 178.2 mg. percent. The blood count; hemoglobin 80 percent; red blood cells 4,040,000; white blood cells 13,050; and the differential: juveniles 2, bands 2, segmented 87, lymphocytes 8, and eosinophils 1. A blood culture was negative.

Treatment with intrathecal penicillin and sulfadiazine by mouth was instituted. Intrathecal and intramuscular penicillin was continued in doses of 10,000-15,000 units twice a day until 27 June 1944 when a total of 320,000 units had been administered intramuscularly and 305,000 units intrathecally. A total of 233 grams of sulfadiazine was administered during this period. Spinal fluid cultures made almost daily, produced an organism identical to that found in the original examination. The number of yeastlike cells was estimated on each specimen of spinal fluid varied from 15 to 844 per cm. The accompanying table shows the decrease in the number of yeast cells observed during and following treatment. At no time was there evidence of increased spinal fluid pressure. Urine examinations, blood Kahns, and spinal fluid Kahns were uniformly negative. Colloidal gold curves frequently showed slight reaction in the first 8 tubes, but were not characteristic of any specific type of reaction. Erythrocytic sedimentation rates were within normal limits.

Gram smears of the spinal fluid consistently showed gram-positive coccus forms. On close observation it became apparent that some of the cocci were too large for typical staphylococci, and that a large number did not divide by binary fission, but by a type of budding or sprouting. Both characteristics are typical of many members of the group comprising the asporogenous yeasts.

In fresh cultures of 24 to 48 hours, the organisms are spheroid, and range in size from $\frac{1}{2}\mu$ to $1\frac{1}{2}\mu$. They are amphophilic, the smaller or younger forms staining with gram, and the larger with gentian violet. The characteristic budding is apparent in many of the organisms, but some appear to divide more equally.

There is greater variation in size in the older cultures up to 30 days. Here the individual yeast may obtain a size from 4μ to 5μ , and a capsule is more in evidence than in the younger cells, where only occasionally it is discernible.

TABLE 1

Date	Organisms/cm. Spinal fluid	Treatment
7 June	Many	Intrathecal and intramuscular penicillin. Also oral sulfadiazine. 7-27 June.
12 June	Many	
15 June	Many	
17 June	534	
18 June	225	
19 June	174	
20 June	80	
22 June	38	
23 June	34	
24 June	30	
25 June	22	
26 June	31	
28 June	27	
6 July	18	
11 July	15	Heat-killed vaccine. 8 July-1 Aug.
12 July	95	
17 July	30	
20 July	27	
26 July	844	
27 Sept.	490	Triturated vaccine. 1 Aug.-30 Jan.
25 Nov.	Neg.	
17 Jan.	Neg.	

The organisms grew luxuriantly on most media; this is particularly true of the chocolate agar, blood agar, and the maltose and dextrose media of Sabouraud. Inoculations from spinal fluids positive for the yeast showed abundant growth on chocolate agar enriched with liver extract. In 72 hours it was apparent that the organism grew as well anaerobically as aerobically. The colonies varied from 2 to 4 mm. in diameter. They were ovoid to spherical, had slightly lobulated edges with a tendency toward flatness, and varied in color from white to dirty yellow. A few of the colonies were rugose with radiating striations, while the center of the colony was elevated and convex. These were desiccated and the edges only slightly lobulated. Often these colonies were pink to red on chocolate agar. On blood agar there was luxuriant growth, probably better than on chocolate. With heavy inoculation the colonies tend to confluence. In color they were grayish-white with a decided but low-grade hemolysis. The discrete colonies were from 1 to 2 mm. in diameter at 72 hours and were of the same general description as those on chocolate.

Growth experiments on blood and chocolate media showed that the organisms grew much more luxuriantly at 37° C. than at 20° C. There appeared to be little difference in growth between those incubated anaerobically (10 percent carbon dioxide) and those aerobically. The blood plates at 37° C. showed a marked hemolysis (both aerobe and anaerobe), while plates from the same inoculation at 20° C. showed no hemolysis.

Initial inoculations on blood agar media showed marked hemolysis, which gradually disappeared over a period of 30 days with repeated subculturing. Direct spinal-fluid inoculations, made from the patient approximately 3 months after the first ones, showed no hemolysis at all. The morphology of the organism is such that, with only superficial observation, confusion with some of the larger members of the coccaceae would be possible. The question of the organisms' taxonomic position is extremely interesting, and an attempt was made to classify the form from previously published accounts.

Dodge (6) in his Medical Mycology lists 14 species of cryptococcus. Unfortunately, the genus and the included species are poorly defined. Differentiation

is based largely on morphological characters and tendencies toward pathogenicity, both of which are extremely variable. The individual morphological characteristics of the cell and the appearance of the colony are dependent both on the age and on the constituents of the artificial media on which the form is grown. Pathogenicity likewise is a variable, and virulence in many of the forms is a transitional phase. The use of these characteristics makes classification difficult. Following Dodge's key for the pathogenic species of the cryptococci, it was found that this organism forms colonies which vary in color from white to yellow. There is no trace of a pellicle or ring on malt extract or the common sugar solutions, and a capsule is poorly developed. This leads the authors to believe that it is not improbable that they are dealing with an undescribed strain.

Perhaps of greater general medical interest than the somewhat academic question of taxonomy is the problem of response of the organism to bacteriologic and bacteriostatic agents. A series of tests to determine the susceptibility of the organism to penicillin, and a series of penicillin assays to determine the strength of penicillin in the spinal fluid were made by the pour plate-penicylinder method. Penicillin of 5,000 Oxford units per cc. was used as a control with equivalent amounts of the spinal fluid. The assay demonstrated approximately 1,450 Oxford units of penicillin per cc. Subsequent tests demonstrated 1,250, 500, 625, 138, 475, again 475, and finally 312 units per cc. During this period the spinal fluid sulfadiazine level was maintained at 10 mg. percent.

Four percent sodium sulfadiazine, like penicillin, produced a marked effect *in vitro* on the organisms. This strength drug cleared an area of standard endospore substrate comparable to that cleared by a concentration of 625 Oxford units per cc. The sodium salt of sulfadiazine in concentrations of 0.05 and 1.0 percent produced no effect. The sodium salt of sulfathiazole and acriflavin produced similar negative results. Gentian violet in concentrations of 0.25, 0.50, 0.75, and 1.0 percent after 48 hours produced no effect on the organisms.

Therefore it may be concluded that the intrathecal administration of the usual concentration of the sodium salts of sulfadiazine probably resulted in a dilution so high as to be ineffective on the organisms in the spinal fluid. The marked reduction of the number of organisms in the spinal fluid from approximately 800 cu. mm. to 15 per cu. mm., during the span of time indicated by these experiments, is very probably due to the sodium salts of penicillin.

The susceptibility tests of white mice and rabbits to the yeast were uniformly negative with one exception. A mature rabbit after two intravenous injections with 0.5 cc. of the yeast cell suspension, died after 5 weeks. Pathological findings were negative, but the organisms were recovered from the blood stream and peritoneal fluid.

It is reported in the literature that generally, agglutination tests on related forms which have been attempted were negative. Antigens were prepared of the cultures in a manner comparable to those used in the Widal. Agglutinations of the patient's serum with these yeast antigens were consistently negative. However, a series of intravenous injections of the living organisms into a rabbit produced a titer in the serum sufficiently high to give a positive agglutination up to 1-80. However, the authors have been unable to confirm this observation.

The first few days of the patient's hospitalization were quite stormy. He continued to be disoriented, confused, and to demonstrate the positive neurological findings described above. Four days after institution of treatment the temperature which had previously ranged between 100° and 102° F. dropped to normal. He became more rational and began to take fluids by mouth. Following this his condition constantly improved with the exception of occasional

headaches and almost constant vertigo on changing the position of the head. Neurological signs disappeared after the first week with the exception of a positive bilateral Babinski which persisted for several weeks. The last spinal fluid examination was made on 16 January 1945. This revealed no yeast cells, one lymphocyte per cu. mm., total protein 44.5 mg. percent, Pandy trace, sugar 62.5 mg. percent, and normal gold sol curve. Fluid was under no increased pressure and was clear and sparkling. During the period of intensive treatment the sulfadiazine blood level was maintained between 10 and 18 mg. percent. The spinal fluid sulfadiazine level was maintained at about 10 mg. percent.

The only other specific treatment was the administration of autogenous vaccines of the organisms isolated from the spinal fluid. A heat-killed vaccine was administered subcutaneously, and begun 8 July 1944 with an initial dosage of 0.2 cc. This was given every 4 to 5 days with increasing dosage up to 1.0 cc. On 1 August 1944 an autogenous steel-ball-mill triturated vaccine (prepared by Capt. A. Krueger (MC), U. S. N. R.) was administered in increasing doses of from 0.1 to 1.0 cc. every 4 days until discharge from service 30 January 1945. It will be observed that the clinical improvement in this case preceded the administration of the vaccines.

On 30 January 1945, after 8 months of hospitalization, the patient was discharged, at which time the neurologic signs were absent, and the subjective symptoms had shown a marked improvement. The patient's only complaints were of occasional headaches and vertigo on rapid changing of the position of the head. The writers do not feel that an absolute cure can be claimed in this case. This disease is of a chronic nature, often producing symptoms over a period of several years. It is felt, however, that a marked improvement was obtained by the use of penicillin, sulfonamides, and autogenous vaccines.

SUMMARY

Cryptococcus meningitis is a rare disease usually confused clinically with tuberculosis of the meninges. The diagnosis rests upon finding budding yeastlike organisms in fresh spinal fluid or by culture of the organisms.

A case is reported in which early diagnosis and treatment with sulfonamides, penicillin, and autogenous vaccines was followed by marked clinical improvement.

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Dentigerous Cyst Originating From An Inverted Mandibular Third Molar Tooth

Report of a Case

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ADENTIGEROUS cyst is a cystic degeneration of the tooth follicle of an unerupted tooth. It develops from the enamel organ after the dentin and enamel of the crown have been laid down (1). The cause is unknown. Histopathologically, its innermost lining consists of stratified, squamous epithelium derived from the enamel epithelium of the tooth germ. Its outer covering consists of connective tissue originating from the connective tissue of the tooth follicle. The cyst sac, which contains an accumulation of a clear, serous, sterile fluid, is attached to the tooth along the cemento-enamel junction (2).

CASE REPORT

The patient, an arthritic, was referred to the dental department for consultation concerning foci of dental infection. His only complaint was a foul discharge from the lower right molar region.

Examination.—Oral examination revealed slightly hypertrophied mucous membrane in the third molar region. A fistula was noted just distal to the second molar, from which a serous exudate could be evacuated upon probing. In this region part of the alveolar process was destroyed; the concavity, about the size of a molar crown, was filled with fibrous tissue. The third molar was missing.

Oral radiographic examination revealed an inverted third molar tooth completely embedded in the right ramus of the mandible. The mesial portion of the crown was in apposition with the mandibular canal. The roots were in the same vertical relationship as the roots of the maxillary molars. The crown of this tooth communicated with a radiolucent area, which extended mesially nearly to the distal root of the second molar (fig. 1).

A diagnosis of dentigerous cyst was made, which was considered a focus of infection. Its removal was recommended and the patient was prepared for surgery. As a prophylactic measure, 2 gm. sulfadiazine were given initially, followed by 1 gm. every 4 hours, beginning 24 hours before and continuing for 24 hours after the operation. Nembutal 1½ grains 1 hour before the operation, and morphine sulfate grain ¼ with atropine sulfate 1/150 grain on call, were given as premedication.



Figure 1.—Right: Pre-operative extra-oral radiogram, showing the inverted mandibular third molar in the ramus and the bone involvement.

Surgical procedure.—A right mandibular block of procaine hydrochloride was given. Also, a generous amount was infiltrated for hemostasis in the buccal and lingual soft tissues of the ramus of the mandible. An incision was made from the coronoid process, along the external border of the ascending ramus, extending down over the crest of the alveolar process to the distal of the second molar and then diagonally and anteriorly along the buccal plate to the mucobuccal fold in the region of the first molar. The mucoperiosteum was elevated and retracted buccally exposing the buccal plate of the body and ramus of the mandible overlying the inverted third molar and the cyst. Numerous holes were bored with a surgical bur along the buccal plate overlying the third molar and cyst. Sufficient bone was removed with rongeur forceps and chisel to expose the crown of the third molar. In order to conserve bone, the crown was separated from its roots by using a cross-cut fissure bur at the cemento-



Figure 2.—Post-operative view, showing the bony cavity.

enamel junction; likewise, the crown was cut in half and the pieces were removed. The roots were delivered through the space formerly occupied by the crown of the tooth. The cyst was enucleated completely. A thorough débridement of the bony defect was made. An iodoform gauze dressing was packed loosely to fill completely the bony cavity. This measure was taken to control post-operative hemorrhage, in view of the large bony defect, and to prevent post-operative infection by reducing the extent of the blood clot. The muco-periosteal flap was sutured with No. 000 catgut in its original position.

Post-operative course.—The first post-operative day, a medium amount of edema of the buccal soft tissues and slight trismus was present. Recovery was uneventful. It was estimated, that it would take 1 to 1½ years for the bone to regenerate and to fill the cavity completely (fig. 2).

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Incarcerated Littre's Hernia

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LITTRE (1) in 1700 described a diverticular enterocele involving less than the full circumference of the bowel. To this specific hernia he gave his name. It is differentiated from a Richter's hernia by the inclusion of a Meckel's diverticulum alone.

Meckel (2) in 1809 first adequately described the anomalous structure which bears his name, although Levater, in 1672 recorded an earlier observation of a pouched appendage of the small intestine.

Meckel's diverticulum may occur as a slightly distended widening of the lumen of the ileum or as a blind pouch up to 6 inches in length, as reported by Shepherd (3). The average length is 5 centimeters as determined by Lamb (4). It may be found anywhere from 3 centimeters to 3 meters distant from the ileocecal valve, according to Brenemann (5), although it usually lies about 3 feet from this point. Atwood (6) states that it may occur at any point between the pylorus and the ileocecal valve and that it is ordinarily antimesenteric, though it may arise at either side or between the mesenteric leaves. Howell (7) reports a case of secondary diverticulosis in which the original Meckel's diverticulum contained two small daughter diverticula at the tip. He refers to Meckel's diverticulum as a true or complete diverticulum because its walls are composed of all the coats of the bowel. Heterotopic cells found associated with ileac mucosal cells are: gastric type, pancreatic cells (including islets of Langerhans), duodenal, colic, and rectal mucosal cells.

The structure is reported by different authorities to occur in from less than 1 to as high as 3 percent of all autopsies with a sex incidence of 1.3 to 3 in the male and 1 in the female. Meckel's diverticulum has been found included among the contents of inguinal, femoral, and umbilical herniae, and even hernia into the greater sciatic foramen. Ravdin and Hodes (8) report a case of retroperitoneal hernia containing an unusually large Meckel's diverticulum.

CASE REPORT

G. H., a 63-year-old white male, was admitted on 11 September 1947 with a complaint of pain in the right inguinal region. He had been in excellent health

until 1 day prior to admission. He had undergone surgery in 1932 for repair of a right inguinal hernia.

On 10 September 1947, while at work shoveling concrete, he felt a sudden burning sensation in his right groin and noticed a lump in his right inguinal region at the site of the herniorrhaphy. The burning persisted and the lump remained prominent. He was treated at the medical facility on his station and was transferred to the hospital after efforts at reduction failed.

Physical examination revealed a robust male age 63. The heart and lungs were normal. The abdomen was normally rounded, nonrigid, nontender: no masses were palpable other than a slightly tender subcutaneous mass about the size and consistency of a testicle, movable, irreducible, presenting no impulse on coughing or straining. There was no palpable weakness of the muscle wall. The scrotum contained two normal testicles.

Temperature, pulse, respirations, blood pressure, and blood-cell count normal; Kahn negative; urine showed occasional leukocytes and rare erythrocytes.

Pre-operative diagnosis.—Incarcerated direct right inguinal hernia, recurrent after surgery.

Immediate operation.—11 September 1947, a herniorrhaphy, direct, right inguinal, was performed under spinal anesthesia, supplemented by cyclopropane, ether, and oxygen. Skin incision parallel to fibers of external oblique, 1 inch above Poupart's ligament.

The spermatic cord was found transplanted superficially. It overlaid a firm rounded mass 4 cm. in diameter, enclosed by a densely fibrous wall emerging through a defect in scar tissue midway between the internal inguinal ring and the pubic spine. The cord was retracted laterally and the mass cleared, revealing firmly packed properitoneal fat, several layers of which were dissected in exposing a peritoneal hernial sac, which when opened revealed an edematous purple Meckel's diverticulum. The neck of the diverticulum so completely filled the hernial opening in the surrounding cicatricial tissue that reduction was impossible; it was likewise impossible to introduce a hemostat in the opening.

The opening was carefully enlarged until reduction could be effected, the sac transfixated and ligated and the defect closed. The anatomy was poorly defined, but the conjoined tendon was identified and sutured to the shelving portion of Poupart's ligament. The aponeurosis of the external oblique was sutured. The subcutaneously transplanted spermatic cord was left undisturbed. The skin was closed with clips, draining the subcutaneous space. Cotton No. 0000 ligatures and cotton No. 00 sutures were employed.

Following closure, a second operation, resection of Meckel's diverticulum, was performed. Transverse skin incision; aponeurosis and muscle split. The diverticulum was readily located and delivered. It was mildly injected and edematous, having lost its purple color. It arose from the lateral wall of the ileum with a short thick mesentery derived from the mesentery of the ileum. A serosal fold formed a lacunar membrane to the bowel wall. Several sacculations appeared about the tip, with several fatty epiploic appendages between (fig.1). The diverticulum was resected between Kocher clamps after transfixion and ligation of its mesentery, with chromic No. 1. The stump was invaginated with a double row of chromic No. 0 atraumatic sutures. The lumen of the ileum was adequate. The inner wall of the repaired defect was palpated and found to be well closed. The ileum was followed 3 feet distally to the cecum. The appendix did not deliver readily and was not visualized. Closure in layers without drainage.



Figure 1.—Showing edematous diverticulum.

DISCUSSION

Meckel's diverticulum, when it occurs, is all too frequently involved in mechanical mischief, even everting itself and migrating down the lumen of the bowel to form an intussusception. While inclusion of a Meckel's diverticulum in hernial sacs has been reported in at least 160 cases, its incarceration has been reported in the literature in less than 100 cases, and rarer still is a true Littre's hernia, containing no other intra-abdominal structure. A search of the literature fails to reveal a prior case of Littre's hernia of a direct inguinal type, recurrent after operation, as reported here.

While this case was diagnosed early enough to preclude strangulation, a few more hours of continued constriction of the neck of the edematous herniated structure, in the firm fibrous hernial orifice most certainly would have led to strangulation, even without the trauma of repeated examination and light taxis.

Unusual features of the specimen were the presence of a mesentery providing blood supply to the diverticulum, and the secondary diverticular sacculations arising from the original Meckel's. The heterotopic mucosal tissue demonstrated was of the usual nature.

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Diffuse Peritonitis Secondary To Bacillary Dysentery

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THE deployment of armed forces personnel throughout the warm climates has brought about a greatly increased familiarity with so-called tropical diseases. The experience thus acquired is not only of value in the care of infections in the regions where these diseases are endemic, but will also aid in the after-care of patients who are returned to the United States and in the treatment of civilians among whom a greatly increased incidence of these conditions is to be anticipated. It is important, therefore, that all observations which may add to our information concerning these diseases be recorded.

Suppurative peritonitis as a complication of bacillary dysentery is a rare phenomenon. Stitt¹ does not include perforation of the colon or peritonitis among the complications of this disease. He states, "In chronic dysentery, Manson-Bahr in a series of some 300 autopsies performed in Egypt, found 3 instances of antemortem perforation of the transverse colon with general peritonitis. Such a condition, while not uncommon in amebic dysentery, has not been reported before in bacillary dysentery." This complication is uncommon in this type of enteric lesions. The pathology consists of a diffuse enteritis involving the colon. When ulcers are present they are characteristically shallow and are not undermined.

In the case reported, a diffuse suppurative peritonitis developed in a patient who presented clinical evidences of dysentery due to *Shigella dysenteriae*. The peritoneal infection appeared to emanate from the descending colon and no other lesion was discovered to explain the peritonitis. The picture is admittedly incomplete. There was no growth from cultures of the purulent peritoneal exudate obtained at operation, presumably because the cultures were delayed in reaching the laboratory. Exploration was necessarily limited by interest in the safety of the patient. It is impossible to state whether there was a gross perforation of an ulcer in the colon or whether peri-

¹ Strong, R. P.: *Stitt's Diagnosis, Prevention and Treatment of Tropical Diseases*. 6th edition. The Blakiston Co., Philadelphia, Pa., 1943.

tonitis resulted from the penetration of organisms through the intestinal wall. Recovery followed surgical drainage and chemotherapy so that complete gross and microscopic pathological studies were available.

CASE REPORT

H. P., male, was admitted to the hospital on 10 June 1945 with the diagnosis of peritonitis, general, acute. The patient complained chiefly of abdominal pain and vomiting. He stated his illness began about 1 week prior to admission, with the frequent passage of loose watery stools. Four days before admittance he began to have very severe pain in the left flank which increased progressively in severity and spread to involve the entire abdomen. Repeated vomiting and severe retching were associated with the pain. He had been having chills and fever for the past 2 days.

Physical examination.—A well-developed and fairly well nourished young white male who appeared acutely ill. Temperature on admittance 105° F., pulse rate 128, respiration 20, blood pressure 118/70. Chest examination was negative. The abdomen was slightly distended and tympanitic throughout. There was diffuse tenderness over the abdomen, more marked over the left side, and rebound tenderness over the left lower quadrant. There was rigidity of the abdominal wall over a wide area, and especially acute over the lower half of the left abdomen. There was tenderness in both flanks, especially the left. Peristaltic sounds were active.

Laboratory examination.—Red cell count, 4,650,000; Hb—13.5 gm. (Sahli); leukocytes, 13,100, with 4 band forms, 87 segmented forms, and 9 lymphocytes. Urinalysis showed sp. gr. 1.025, albumin 3 plus, red blood cells, 4 to 6 per high-power focus and occasional leukocytes. Roentgenogram of the abdomen revealed "marked dilatation of the small bowel and portions of the large bowel." Retrograde pyelogram and ureterogram revealed no abnormalities and no evidence of extravasation of the dye. Supportive therapy, in the form of venoclysis of dextrose and saline, penicillin and sulfadiazine was instituted. On the following morning the temperature was 102.8° F. the white blood cell count 11,350, with 65 percent segmented forms. The patient was having frequent liquid bowel movements, some of which were stained red while others were clear bright yellow fluid. The abdomen remained rigid and tender, especially on the left side. Exploratory laparotomy was done because of the presence of diffuse peritonitis, of probable colonic origin.

Operation.—The abdomen was opened through a left rectus incision, under spinal anesthesia. A diffuse fibrinopurulent peritonitis was present. There was a pocket of thick creamy pus, with a foul colon bacillus odor, which led down to the descending colon just above the sigmoid. No actual perforation was seen, but exploration was limited. A Penrose drain was carried down to the depth of the pocket, and brought out through a stab wound in the flank. One hundred thousand units of penicillin, dissolved in 40 cc. of water, was instilled in the peritoneal cavity, and the abdominal wound was closed. The immediate post-operative condition was good.

The course following operation was characterized by surprisingly rapid and dramatic improvement. Wangensteen suction was used, sodium sulfadiazine intravenously, and penicillin intramuscularly in doses of 20,000 units every 3 hours. The temperature dropped abruptly to 101° F., then gradually fell to normal and the general condition and the patient's sense of well-being showed

corresponding improvement. The diarrhea subsided rapidly and stools were formed and regular after the first week. Drainage from the stab wound ceased after the first 2 weeks and the patient was discharged to full duty 36 days after operation.

Stool cultures were made from liquid fecal material passed before the operation: gram negative, nonmotile rod was isolated which, on the basis of its cultural reactions, was identified as *Shigella dysenteriae*.

SUMMARY

1. Peritonitis is a very uncommon complication of bacillary dysentery.

2. A case is reported in which diffuse peritonitis developed in a patient with *Shigella dysenteriae* dysentery. Recovery followed surgical drainage and chemotherapy.



Inflammatory Tumor of Colon of Amebic Origin

Report of a Case

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INFLAMMATORY tumors of the colon caused by *Endamoeba histolytica* are a rare entity. On a large proctologic service handling approximately 2,500 patients each year, this is the only case encountered during a 12-year period. Therefore, the author feels that it merits reporting.

A brief review of American literature reveals that only six similar cases have been reported, all but two of these came from a subtropical area. In 1935 a case of amebic tumor was reported from Boston (1). Likely and Lisa (2) in 1942 reported a similar case from New York. Silverman and Leslie (3) reported four cases from New Orleans in 1947. An incomplete review of foreign literature (4) shows approximately 10 such cases being reported from tropical and subtropical areas where amebic infestation tends to be much more widespread.

CASE REPORT

J. H., a white male aged 50, was in good health until 20 November 1946 when he noticed loose, watery diarrhea with associated crampy abdominal pain. The patient passed five to nine such stools daily. He was seen by his family physician and the usual regime of paregoric and bismuth instituted. This treatment relieved the pain and diarrhea but symptoms recurred with more severity periodically until 2 December 1946 when a stool examination revealed *Endamoeba histolytica*. Specific treatment was started; regression of symptoms occurred and on 10 December 1946 stool examination was negative, and the patient had improved clinically. Severe diarrhea recurred on 5 January 1947 and direct smears 9 days later were positive for *E. histolytica*. Digital examination at this time revealed a stony, hard, rectal mass and hospitalization was advised. The patient lost 15 pounds weight during this period.

He was admitted to the hospital on 15 January 1947 at which time examination revealed a well-nourished white male weighing 135 pounds. The remainder of the examination was entirely negative except for rectal examination which revealed a firm, large, annular mass involving mainly the posterior and right lateral walls of the rectum and which was partially fixed posteriorly. Laboratory examination: Red blood count, 3,900,000; Hb., 12.5 grams; white blood count, 9,100 normal differential count; urine examination and Kahn tests nega-

tive. Stool examinations at this time were negative for ova and parasites. Sigmoidoscopic examination revealed a mass at 6 cm. which appeared as an annular, bloody, fungating lesion, the center of which had undergone necrosis. It was possible to pass the scope beyond the lesion and the mucosa above that to the 25 cm. mark was entirely normal. In spite of the previous positive smears, a tentative diagnosis of carcinoma of the rectum was made and a specimen for biopsy was taken. The biopsy report was ulceration of the large bowel, cause undetermined. Barium enema was negative. The clinical impression of carcinoma was so firmly fixed that another specimen for biopsy was taken with the same result. On 10 February 1947 another sigmoidoscopic examination was made and at this time the mass had subsided somewhat, being less firm and appearing more inflammatory in nature. Above the first valve of Houston were seen numerous umbilicated ulcers with gray necrotic bases which bled easily on swabbing and which were separated by normal mucosa. Despite the fact that stools and direct smears remained negative for ova and parasites, a diagnosis of amebic granuloma was made and a therapeutic course of emetine and carbarsone instituted. Treatment resulted in complete disappearance of the mass, the associated ulcers, and of all symptoms in 14 days. The patient has been followed for a period of 12 months and has had no recurrence.

COMMENT

The difficulty in distinguishing between an amebic granuloma and malignancy is here readily illustrated. The clinical characteristics, upon inspection and palpation, were so typically those of carcinoma of the rectum that not only one, but two specimens were taken for biopsy despite the previously positive stools. It required a change in the character of the lesion with the appearance of typical amebic ulcers to point the way to correct diagnosis, the importance of which cannot be over-emphasized in light of the universal response of this type lesion to specific therapy.

The author wishes to point out that were such a lesion to exist at a higher level in the colon where it could be demonstrated only by use of the barium enema, needless surgery might be undertaken. For this reason, it is suggested that in the younger age groups, particularly where there is a history that is at all suggestive of amebiasis and when the lesion is so located that direct visualization and biopsy are not feasible, a trial of specific therapy may well be justified.

Up to the present time this lesion has been rare. However, large numbers of service personnel have had contact with ameba-infested areas during the past war years, and now patients are seen in ever increasing numbers with active amebiasis or with a recent history of this disease. For these reasons it is felt that this lesion may soon cease to be a rarity and at present must no longer be considered geographical.

SUMMARY

1. A case of inflammatory tumor of the colon of amebic origin is reported.

2. The difficulty in distinguishing this lesion from malignancy and the importance in doing so, in view of the therapeutic implications, is pointed out.

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Cholelithiasis in Childhood

Report of a Case in a 15-Year-Old Girl

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BILIARY tract disease in children or young adults, although not uncommon, is infrequently diagnosed probably because of the common conception that it occurs only in older age groups. Potter (4) in his excellent monograph in 1928 was among the first to emphasize the occurrence of biliary disease in children. He made an extensive review of the literature (25,000 cases) in which he reported a total of 226 cases of gallbladder disease in children 15 years old or younger. In a later review (5) he found 432 cases which were reported over a period of 216 years. Kellog (2) found an additional 64 cases reported during the period 1926 to 1940, including some of Potter's cases but adding some of his own. Almost 450 cases of biliary disease have now been reported in the age group 15 years or younger.

The etiological considerations in the child or young adult are similar to those in the older age groups. The cause of the disease has been variously attributed to infectious diseases, malformations of the biliary passages, and regurgitation of the pancreatic juices into the bile ducts (8). The role of infectious diseases is probably of primary importance in the production of biliary disease (1). Typhoid fever (although now uncommon), influenza, appendicitis, scarlet fever, diphtheria, and infections of the digestive tract are the diseases most frequently inculpatated. Congenital anomalies of the biliary tree must always be considered as an etiologic factor in the production of biliary stasis and gallstone formation. Ladd (3) has written an excellent treatise on this subject. Congenital anomalies in Potter's series occurred in 10 percent of the cases (4). Seidler and Brackeley (6) report a case where biliary stasis was due to compression of the common bile duct by an enlarged, indurated lymph node.

Symptoms of biliary tract disease in children are similar to those of the older age groups but may be and are frequently interpreted differently. Many of the vague "stomach aches" of children may be a

manifestation of gallbladder disease, particularly when there is a history of previous undiagnosed attacks of abdominal pain. Epigastric pain in children usually leads to the diagnosis of appendicitis; most authorities admonish one to examine the biliary tree at operation when the appendix fails to satisfy the clinical symptoms (6). In the presence of jaundice in young people the possibility of gallbladder disease must always be considered. In Tearnan's series of cases jaundice was present in somewhat less than 50 percent of the cases (8). Other symptoms frequently present are: nausea, vomiting, belching, and eructation (1). Physical findings are usually limited to epigastric or right upper quadrant abdominal tenderness. The systemic reaction depends upon the severity of the biliary disease.

The age of the patient is never to be considered of primary importance in the diagnosis of gallbladder disease. Kellog (2) in a review of the literature reported cholelithiasis in a fetus and in 7 instances in the newborn infant and Spence (7) reported a case of cholelithiasis in the new-born infant. Wendel (9) reported two cases of cholelithiasis; one in a 19-month-old girl who died with a ruptured gallbladder and the other in a 7-year-old boy in whom gallstones were found at surgery. Some authors are of the opinion that in many instances when cholecystitis and cholelithiasis are first recognized in adult life, the condition actually began in childhood; the symptoms then being regarded as instances of catarrhal jaundice, gastro-enteritis, or indigestion of some sort. Cholecystography is of considerable aid in the diagnosis of gallbladder disease in the young. This is particularly true in cases of repeated attacks of undiagnosed abdominal pain (6).

Treatment of gallbladder disease in the young is the same as in the older age groups. Early surgical removal of the gallbladder in frank cases of cholecystitis, particularly in cases where gallstones are present, gives relief of symptoms in the majority of cases and avoids the possibility of disease of the liver and pancreas in later years.

This case is reported in order to focus attention on biliary tract disease in children, and to stress the fact that this disease occurs more frequently in the younger age groups than has been commonly believed.

CASE REPORT

The patient, a 15-year-old girl, was first seen on 18 April 1946. She complained of repeated attacks of epigastric abdominal pain associated with occasional nausea and vomiting for the past 2 years. The present "attack" had been present for 6 days and was similar in all respects to the previous epigastric discomfort. The pains were typically severe and sharp and frequently radiated to the back. Vomiting occasionally relieved the pain. Bowel movements had been normal and no abnormal stools had been noted. There were no genito-urinary tract complaints. There was no relation between menstrual periods and the epigastric pain. The systemic review was negative.

The past history was negative for any acute infectious diseases. In October 1945 an appendectomy had been performed for symptoms similar to those present without obtaining relief.

The physical examination revealed normal temperature, respirations, and pulse; the blood pressure was 114/60. Examination of the abdomen revealed tenderness in the epigastrium and over the gallbladder area. No masses were palpable. There was no jaundice present. The remainder of the physical examination was negative.

A soft diet, bed rest, tincture of belladonna and elixir of phenobarbital resulted in steady symptomatic improvement, and she was discharged on 22 April 1946. On 6 May 1946, she was readmitted with a recurrence of the same symptoms. The physical examination was again negative except for tenderness over the gallbladder area. The blood count and urinalysis were normal. The icterus index was 11.7. The prothrombin, bleeding, and clotting time were all normal. The sedimentation rate 17 mm. in 1 hour (Wintrob). On 9 May 1946 a gallbladder dye series revealed impaired function of the gallbladder and the presence of many nonopaque stones.

On 23 May 1946, a cholecystectomy was performed. Multiple adhesions were found between the gallbladder and the duodenum; the gallbladder was filled with numerous soft stones and gravel. Microscopic examination of the gallbladder wall was consistent with chronic inflammation.

The post-operative course was uneventful and the patient was discharged on 3 June 1946.

SUMMARY

1. A case of cholelithiasis in a 15-year-old girl is reported.
2. Review of the literature indicates that cholecystitis with cholelithiasis in children is not uncommon.
3. In cases of unexplained abdominal pain in children or young adults the biliary system should be investigated.

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Lumbar Vertebral Chordoma

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CHORDOMA is a rare neoplasm arising from the remnants of the primitive notochord. It is characterized by slow growth, a tendency to invade and destroy bone by direct extension, local recurrence after surgical excision and slight or negligible regression following irradiation. Occasionally chordoma is capable of metastases to regional and distant lymph nodes and viscera.

The sites of origin of chordoma are limited to the regions of the vertebral column and the sella turcica since the fetal notochord becomes incorporated into the vertebral column throughout its length. However, it is found more commonly at either extremity of this area of distribution. Horwitz, in 1941 (4), reviewed 245 cases and noted that 88.2 percent occurred in the cranial and sacrococcygeal regions. The remaining 11.8 percent (29 cases) occurred in the vertebral region and in only 12 of these 29 cases was the lesion confined to the lumbar region. The predilection of chordoma for the sacrococcygeal area has never been satisfactorily explained, although some authors believe the high incidence of trauma to the lower end of the spine is an important factor.

Since chordoma occurs so rarely it is difficult to determine accurately the incidence. Gentil and Coley (2) report 7 cases of sacrococcygeal chordoma and 2 of the spheno-occipital type among 31,099 cases of cancer seen during the period from 1930 to 1943. They occur at any age although the greatest incidence is between the ages of 40 and 50. Sacrococcygeal chordoma is encountered more frequently in the male.

The question of trauma as an etiologic factor is highly controversial. Stewart (3), in a review of this subject, states that single or multiple injuries in man, especially in the case of a bone tumor, cannot be seriously regarded as a significant factor in the etiology of neoplasms. A review of the literature reveals 32 percent of the cases of sacrococcygeal chordoma give a history of definite trauma to the lower end of the spine. Ribbert in 1894 (10) demonstrated experimentally the production of tumors resembling chordoma in rabbits which he produced by puncturing the intervertebral disks with a needle, permitting the escape of notochordal remnants through these tiny apertures.

CASE REPORT

A 23-year-old white male was first admitted to the hospital on 21 October 1947. For several months preceding admission the patient noted loss of libido, slight weakness, anorexia and a loss of 5 pounds in weight in 3 months. During the month before admission a palpable swelling in the epigastric region appeared.

Physical examination on admission revealed a slightly icteric, well-developed, well-nourished white male in no distress. A firm tumor approximately 8 cm. in diameter, nontender, and moderately movable was palpated in the mid-epigastrium. Chest roentgenogram was negative. Roentgenograms of the abdomen showed downward displacement of the right kidney. A gastro-intestinal series on 27 October 1947, showed a mass occupying the duodenal curve, apparently extrinsic to the stomach and duodenum extending from D-11 to L-3. Bronchoscopic examination was negative.

The hemoglobin was 13 gm. with a red blood count of 4.2 million per cubic millimeter. The white count and differential were normal and the urine showed a trace of bile. The icteric index was 27.5. Nine days after admission an exploratory laparotomy was performed. Many soft, gray gelatinous masses were found, most noticeable in the region of the duodenum and along the abdominal aorta. The liver contained soft nodular masses similar to the ones described in the abdominal cavity. The bowel and kidneys appeared normal. A specimen of one of the masses was taken for biopsy. It measured 2 by 3 by 3 cm., having no distinct capsule, a semifirm, elastic consistency and a mucinous yellow hemorrhagic appearance on the cut surface. The diagnosis of chordoma was made from the microscopic sections and was confirmed by Dr. Fred Stewart.

Two months after admission he complained of moderately severe upper abdominal and low lumbar pain. He lost 5 pounds in weight over a 2-week period, and the abdominal mass increased in size rapidly, filling the upper abdomen to the umbilicus. Roentgenograms of the chest showed a superior mediastinal mass and generalized peribronchial infiltrations. The patient's condition became worse with progressive abdominal distension. He died on 23 March 1948, of respiratory failure.

Postmortem examination

The body is that of an emaciated white male appearing approximately 23 years old. There is generalized lymphadenopathy, the largest nodes measuring 1 cm. in diameter and being freely movable. There is no edema of the skin or soft tissues. The skin is deeply jaundiced over the entire body.

The pleural cavities contain 550 cc. of clear yellow fluid. The hilar and peribronchial lymph nodes are enlarged and on section are gray-yellow and soft in consistency. Metastatic tumor nodules up to 2 cm. are found in both lungs beneath the visceral pleura. The lungs weigh 780 gm. (left) and 680 gm. (right). There is marked edema and congestion of both lungs with 0.5 cm. raised areas of gray consolidations in both lower lobes. The heart weight 290 gm. The myocardium is pale gray and flabby and the valve leaflets and mural endocardium are smooth and glistening. The aorta is of average size and consistency.

The abdomen is slightly distended and shows a 13.5 cm. healed upper mid-rectus scar. Several recent paracentesis scars are evident on the abdominal wall. The peritoneal cavity contains 1 liter of sanguinomuroid fluid in which strings of mucus float. A lobulated tumor mass is found to be 20 by 36 cm. as it presents anteriorly. It is intimately adherent to the greater curvature of the stomach and the transverse colon, and the greater omentum is enveloped by the tumor tissue. On the left side the descending colon appears to be completely

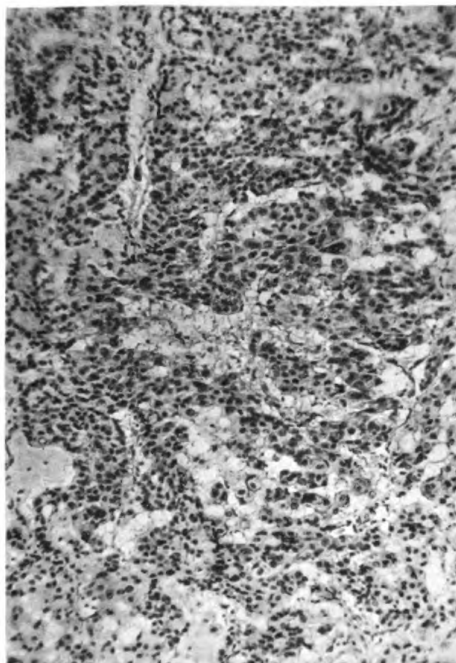


Figure 1.—A low-power view of the tumor showing the cells lying singly, in cords and in masses, separated by wide spaces containing mucin.

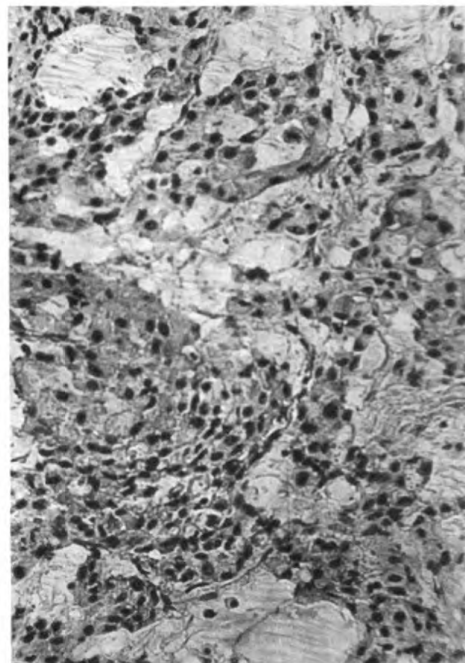


Figure 2.—A high-power view of the tumor showing the presence of intra- and extra-cellular mucin, physaliphorous cells and lobular arrangement of the tumor cells.

surrounded by tumor yet nowhere does it appear to be obstructed. The spleen, adrenal glands, pancreas, and kidneys are densely adherent to the tumor, however, they are grossly not invaded by the neoplasm. The mucosa of the entire gastro-intestinal tract is uninvolved. The liver contains two gray gelatinous tumor nodules. The largest is 4 by 5.5 cm. and lies deep in the parenchyma of the right lobe. In the region of the body of the fourth lumbar vertebra the tumor tissue extends by gelatinous filamentous bands into the bony substance. None of the other vertebral bodies or intervertebral disks appears to be invaded. The intervertebral disks are within normal limits with no narrowing of the spaces. On sectioning the tumor it is found to consist of gray white solid tissue and tenacious yellow mucus which readily pulls out into filamentous strands. In some areas necrosis is a prominent feature. The kidneys, ureters, and bladder are unremarkable. The testicles string moderately well. The prostate gland is of average size and consistency.

Microscopically the tumor consists of large vacuolated cells lying in syncytium-like masses or as irregular loose cords with an abundant mucoid matrix (figs. 1 and 2). In some areas the mucin is more prominent than the cellular elements. The tissue shows scattered areas of necrosis and recent hemorrhage. Physaliphorous cells are seen with their multiple clear cytoplasmic vacuoles. The nuclei of the cells show moderate pleomorphism varying from simple small round to giant polymorphous masses. Mitotic figures are frequent and somewhat bizarre. Tumor metastasis of similar nature were observed in the liver, lungs, and lymph nodes.

SUMMARY

The present instance of chordoma occurring in the lumbar vertebrae is reported because of its rarity, only 13 cases having been reported previously. The abundant mucinous matrix and the large vacuolated "physaliphorous cells" identify this tumor as belonging to this category.

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Neuroblastoma Arising in the Thoracic Sympathetic Chain

Report of a Case

BRUCE H. SMITH, JR., *Lieutenant (MC) U. S. N.*

WILLIAM H. HALL, JR., *Lieutenant (MC) U. S. N.*

THE finding of both a neuroblastoma originating in the thoracic trunk and a superior vena caval thrombosis is unusual. This case is presented because of its unusual occurrence.

CASE REPORT

R. L., a white male, age 12, was admitted on 11 November 1945. Six months previously he had first noted a mild and intermittent pain in the right posterior chest. Three months later the pain became more severe and constrictive in character. On 1 August 1945 roentgenographic examinations of the vertebrae demonstrated no bony involvement. Two months later progressive weakness of both legs was noted, associated with patchy loss of sensation over both lower extremities which was not confined to any particular nerve roots. He was admitted to a local hospital where roentgenographic examination revealed mottling of the sixth and seventh vertebrae and destruction of the proximal portion of the right tenth rib. An exploratory laminectomy was performed and revealed an extradural mass extending from the eighth through tenth thoracic vertebrae on the right. Because of underlying induration, intradural involvement was suspected. Profuse hemorrhage was encountered and for this reason only a biopsy specimen was removed. This on histopathological study was reported as angiosarcoma. On the nineteenth post-operative day he was transferred to another hospital for high-voltage roentgen therapy.

On admission there the general condition of the patient was poor. Physical examination revealed a flaccid paralysis of both lower extremities associated with rectal and urinary incontinence. Roentgen therapy was instituted to three posterior chest portals over the involved area. He received 3,000r of high-voltage radiation to each portal (factors: 250 kv., 0.5 mm. Cu filter, 50 cm. T. S. D., fields 10 by 10 cm., 300r per day to alternating fields). He improved slightly following radiation therapy. In February 1946 spastic paralysis of the lower extremities with flexion deformity occurred. There was mild sensory improvement but the bladder and rectal incontinence persisted.

During the next 12 months his course was ingravescent. In February 1947, he developed subcutaneous edema of the head and neck which was clinically interpreted as early evidence of superior vena caval obstruction. One month later the edema had extended to the thorax and upper abdomen and the superficial

thoracic and upper abdominal veins had become increasingly more prominent. There was no edema of the lower extremities. Roentgen examination at this time revealed further destruction of the vertebral bodies with a mass extending into the right lung field at the level of the sixth through tenth thoracic vertebrae and two 1.0 cm. nodules in the right posterior chest. A subcutaneous mass at the level of the ninth thoracic vertebrae on the right posterior chest became evident and slowly increased in size. There were intermittent periods of cyanosis of the upper extremities and face which became more intense and prolonged. Respiratory embarrassment slowly increased in severity and the patient died on 14 May 1947, approximately 2 years from the date of onset of his illness.

At autopsy the body was found to be emaciated, showing marked flexion of the thighs and calves. Numerous distended veins were seen over the anterior chest and abdomen. A fluctuant mass 4 cm. in diameter over D-9 was incised and found to be filled with foul necrotic material. The body was opened with the usual Y-shaped incision and 900, 800, and 200 cc. of straw-colored fluid were withdrawn from the right and left pleural cavities and peritoneal cavity in that order. A 5-cm. thrombus was located in the superior vena cava from just below the innominate vein to the vena sinus on the posterior aspect of the heart. The heart weighed 180 gm. and was not unusual. Investigation of the right side of the thoracic cavity revealed the presence of a soft, friable, grayish-white tumor mass measuring 10 cm. in diameter, lying on the internal surface of the ninth and tenth ribs, and resting against the vertebral column. This mass was found to be firmly adherent to the diaphragmatic surface of the right lung and to have invaded the tenth rib and the adjacent vertebrae. On section the central portion of the mass was necrotic. The periphery was homogeneously granular gray. Further search revealed the presence of two other subpleural 1 cm. diameter lesions of similar macroscopic description over the third and fourth right ribs in the posterior auxiliary line. The liver was slightly distended and congested. The body of the pancreas contained a 2 cm. hemorrhagic nodule of tumor tissue. Investigation of the spinal cord at the level of D-9 and 10 showed some residual epidural tumor which was continuous with that in the vertebral bodies and the larger mass described above. No evidence of intradural involvement was found. The remaining viscera showed no unusual gross changes.

Microscopically the neoplastic lesion was found to be composed of a diffuse growth of small, rounded cells with prominent hyperchromatic basophilic nuclei and scanty eosinophilic cytoplasm. In a number of areas the formation of rosettes could be seen and closer examination revealed the presence of dendritoid

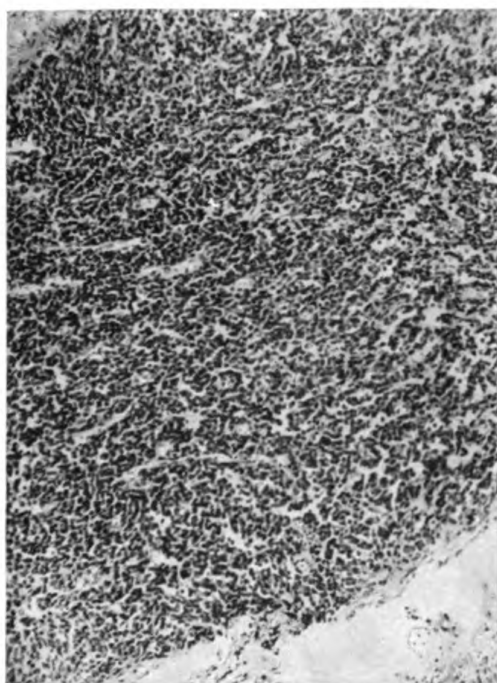


Figure 1.—Low-power photomicrograph showing general histologic appearance of the neoplasm with rosette formation.

processes on some of these cells. Microscopic investigation of the thrombus revealed the absence of tumor tissue (fig. 1).

COMMENT

A brief review of the literature reveals that, though other cases of neuroblastoma arising in the thoracic sympathetic trunk have been reported (3) (5) (9) the usual sites of origin are the suprarenal medulla (1) (2) (4) (5) (9), the retina (2) (5) (9), and the retroperitoneal sympathetic plexuses (1) (5) (6) (7) (9). In the case presented there was conformity with the usual age group, the insidious nature of the onset, the local invasiveness and the reluctance to show generalized metastasis (2) (5) (7) (9).

The extreme vascularity of some of these tumors may give the impression of angiosarcoma.

The thrombus of the superior vena cava was apparently not of neoplastic origin but probably secondary to venous stasis based upon a prolonged period of inanition. It was this rather than the tumor itself which was the immediate cause of the patient's death.

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Benign Ureteral Tumor

Report of a Case

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URETERAL tumors are being reported more and more frequently, over 200 having been described. Benign growths occur with less frequency than malignant tumors and of the latter carcinomata make up the greatest number. Excellent reviews of the subject have been written by Melicow and Findlay (3), Rusche and Bacon (5), Higgins (1), Moore (4), Scott (6), Vest (7), Lazarus and Marks (2), and others. We are reporting this case because of its uniqueness.

CASE REPORT

G. E., a 25-year-old white male was admitted to the hospital on 25 June 1947 with the chief complaint of "kidney trouble." Two days before, upon arising the patient had a dull pain in the epigastrium. During the day the pain grew more severe and became confined to the left upper abdomen and flank. He felt weak and nauseated and an enema gave no relief. His family physician found the urine to contain many white blood cells.

On admission the acute pain had subsided and the patient complained only of dull left flank and costovertebral pain, and mild urinary frequency. The family and marital histories were non-contributory. The general health had always been good although in the past 2 years he had several episodes of epigastric discomfort similar to the present attack at its onset.

Physical examination—Temperature 97.8° F., pulse 80, respirations 20, blood pressure 130/80. The patient was a well-developed and well-nourished white male of 25 years who did not appear ill. The only positive findings were confined

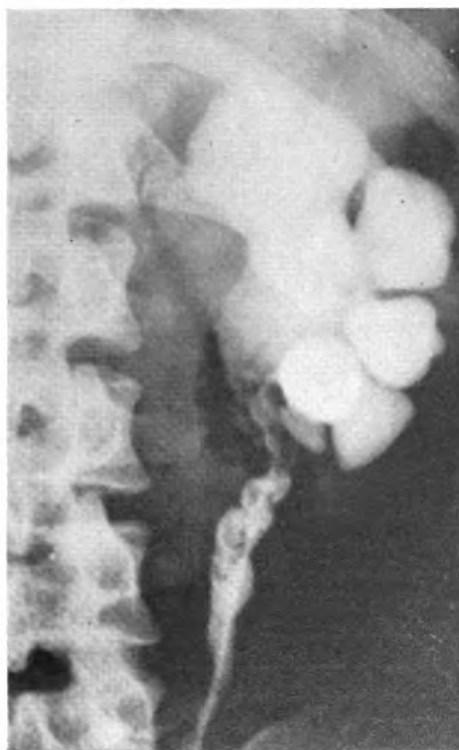


Figure 1.

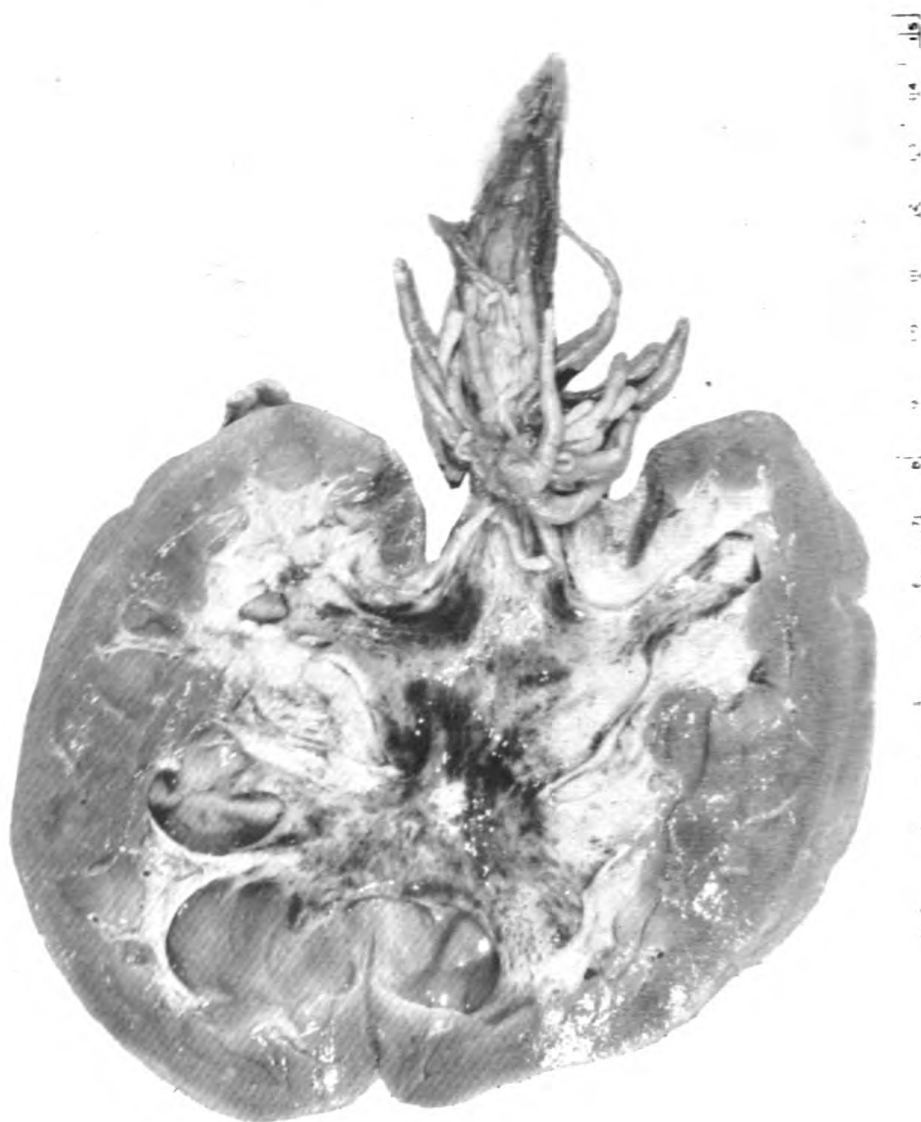


Figure 2.

to the abdomen and back where there was mild tenderness to deep palpation over the left kidney and tenderness to percussion in the left costovertebral angle. No organs or masses were palpable. Urinalysis was negative except for occasional white blood cells in the centrifuged sediment. Red blood count, white blood count, and differential were normal. Blood urea nitrogen was 12.5 mg./100 cc. A second urinalysis was negative and massage of the prostate revealed a normal fluid.

Intravenous urogram showed a normal right kidney and pelvis; there was mild left hydronephrosis but unsatisfactory visualization of the ureter and ureteropelvic junction. The left kidney excreted the dye as readily as the right.

Cystoscopic examination showed the bladder to be normal. No. 5 ureteral catheters passed to both kidney pelves without encountering obstruction. Indigo

carmine appeared in 5 minutes from the right and concentrated readily, and in 12 minutes from the left in poor concentration. Cultures of the bladder and both kidney urines showed no growth. With the patient in the Trendelenburg position a left retrograde pyelogram showed the hydronephrosis and peculiar filling defects at and immediately below the uretero-pelvic junction (fig. 1).

Operation.—The kidney and upper ureter were explored through the usual lumbar extraperitoneal incision. The upper quarter of the ureter was found to be dilated and to contain a firm irregular mass which could be rolled between the fingers. Incision was made in the ureter and immediately several, long, pale, wormlike polypi appeared, some measuring 4 cm. in length. Examination showed most of them to be attached immediately below the uretero-pelvic junction. The ureter was then clamped as low as possible and the kidney and attached ureter removed (fig. 2).

Pathological Report

Gross.—Specimen includes kidney and 8 cm. of ureter. The weight is 168 gm. The kidney surface is smooth and the capsule strips with slight resistance. Cortex and medulla are well differentiated. Cortex measures 5 mm. and medulla 10 mm. The pelvis is dilated and shows many hemorrhages in the mucous

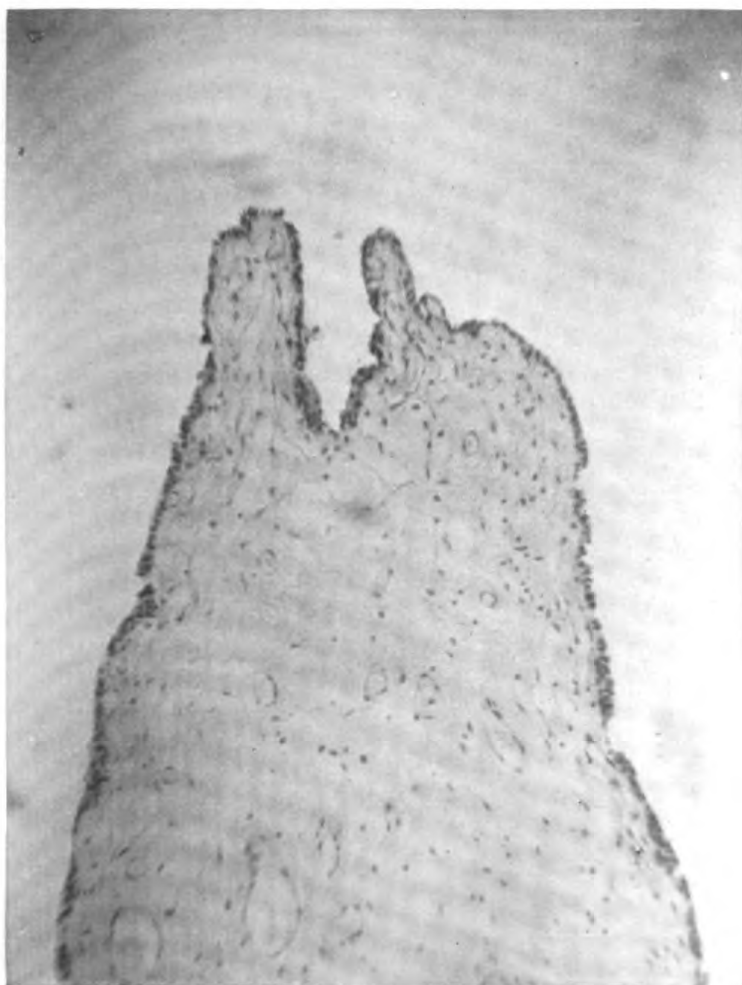


Figure 3.

membrane. Within the lumen of the ureter there are about 20 wormlike projections measuring up to 4 cm. in length and are attached immediately below the uretero-pelvic junction.

Microscopic.—Sections of the ureter show hypertrophy of the muscle layers. There are several papillary projections into the lumen. The projections have a loose fibrous stroma and are covered by moderately hyperplastic transitional epithelium (fig. 3). There is no evidence of malignancy. Sections of the pelvis show subacute inflammation. Sections of the kidney show dilatation of the collecting tubules and enlargement of the glomerular spaces.

Diagnosis.—(a) Benign fibroepithelial papilloma of the ureter; (b) hydronephrosis, moderate; (c) pyelitis, subacute.

The remainder of the hospital course was uneventful and the patient was discharged on the seventeenth post-operative day. When last seen, 3 months later, he had no complaints, urinalysis was negative, and the lumbar wound was firmly healed.

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Solitary Pelvic Ectopic Kidney

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PELVIC single kidney or solitary pelvic ectopic kidney is a rare renal anomaly of which 41 cases have been reported in the literature. The condition was first reported by Henor (1) in 1830. An exhaustive review of the literature by Stevens (2) in 1937 revealed 25 reported cases and he reported 2 additional cases. Stevens estimated that ectopic kidney is found once in about 1,100 routine autopsies and that true pelvic kidney occurs once in about 3,000 cases.

TABLE 1¹

Case No.	Sex and age	Genital anomalies	Clinical diagnosis	Findings
36(4)	Male—22	None.....	Hematuria from pelvic single kidney. Renal tuberculosis.	Absence of left portion of trigone. Excretory and retrograde pyelograms. Diagnosis of tuberculosis verified.
37(5)	Male—7½	Absence of scrotal testicles.	Infected hydronephrosis	Absence of left portion of trigone. Tortuous hydroureter with uretero-vesicle obstruction.
38(6)	Female—20	Uterus and tubes absent. Ovaries not identified.	Pelvic single kidney thought to be uterus.	Excretory urogram post-operatively revealed ectopic kidney of normal size (right).
39(7)	Male—42	Congenital deformity of hands. Absence of right testicle. Internal strabismus.	Hydronephrosis of left ectopic kidney.	Blind right ureter. Pelvic single kidney with hydronephrosis (left).
40(8)	Male—20	None.....	Clinical diagnosis fused pelvic kidney with (?) tuberculosis of epididymus (left).	Urological findings on excretory urogram revealed absence of left kidney and pelvic single kidney. Cystoscopy revealed absence of interureteric ridge and left ureteral orifice.
41(9)	Male—29	None.....	Pelvic mass thought to be appendiceal abscess. (Laparotomy prior to urological study).	Excretory urograms and retrograde studies revealed absence of left kidney and trigone and an apparently normally functioning right pelvic kidney.
42(10)	Male—42	Hypospadias (surgically repaired in childhood).	Albuminuria (etiology to be investigated) discovered on physical examination prior to release from active duty.	Slight congenital distortion of the bladder with high implantation of both ureteral orifices. Single pelvic kidney (left) with essentially normal outline pyelographically. Absence of right kidney. Right ureter being a blind tube about 8 cm. in length.

¹ Table from Stevens (2) and Mays (9).

McCrea (3) in 1942 reported a case and adding 7 cases from the literature brought the total to 35. Since that time 6 additional cases

have been recorded which, with the case to be reported in this paper, brings the total to 42.

The diagnostic procedures necessary in arriving at a correct urological diagnosis have been firmly established and will not be discussed in this report.

CASE REPORT

C. F. J., a 42-year-old white male, was admitted 8 August 1945 with a diagnosis of albuminuria, which was detected on physical examination prior to release from active duty.

Chief complaint.—None. (Three urinalyses done at a naval dispensary on successive days revealed albuminuria.)

Family history.—Noncontributory.

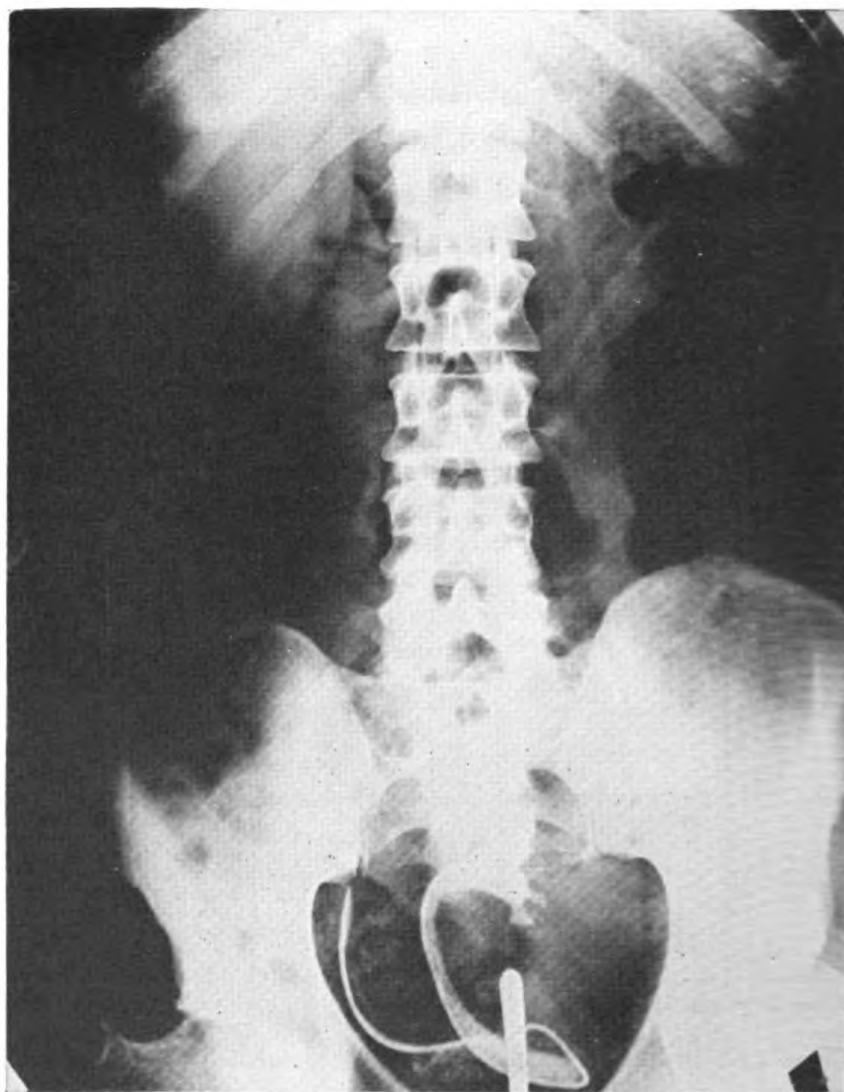


Figure 1.—Retrograde pyelogram showing an ectopic left pelvic kidney. The blind right ureter is outlined by an ureteral catheter.

Past history.—Not remarkable except for surgical repair of hypospadias during childhood and surgical removal of hydrocele in 1942.

Present history.—Patient was referred to a naval hospital for investigation of an albuminuria detected at the dispensary. The patient had no complaints and was asymptomatic except for fatigue attributed to loss of sleep and nervous strain associated with the inevitable last-minute details incidental to being released from active duty. The patient said that he had lost 10 pounds in the past 8 months, which he attributed to lack of attractive meals and considerable walking in the sun. (It is noteworthy that he began gaining weight immediately after admission to the hospital).

Physical examination.—The temperature, pulse, and respirations were normal, blood pressure was 138/80. The rest of the examination revealed no abnormalities.

Course.—On admission the patient was relatively asymptomatic. Laboratory examinations of the urine revealed a persistent albuminuria ranging from a minimum of 5 mg. percent on bedrest to a maximum of 80 mg. percent while ambulatory. On the usual hospital regimen the albuminuria decreased to less than 10 mg. percent. This was interpreted as an albuminuria of orthostatic origin, and was further substantiated by the fact that the usual kidney function tests, including blood urea nitrogen, urea clearance test, concentration-dilution test, phenolsulphonthalein, creatinine excretion, and urinalyses (except for albuminuria) were all within normal limits.

Genito-Urinary Examination

(1) Penile hypospadias—not considered disabling because of operative repair in childhood.

(2) Slight congenital distortion of the bladder with high implantation of both ureteral orifices.

(3) Single pelvic kidney. The left kidney on pyelography was located over the sacrum in the true bony pelvis. The outline of the kidney and the pyelogram were essentially normal (fig. 1).

(4) Absence of the right kidney, the right ureter being a blind tube about 8 cm. in length.

(5) Mild prostatitis which responded satisfactorily to massage.

SUMMARY

A case of a single pelvic kidney is reported bringing the total to 42. Using Mays' table (9) the literature from 1942 is abstracted with the addition of 1 case.

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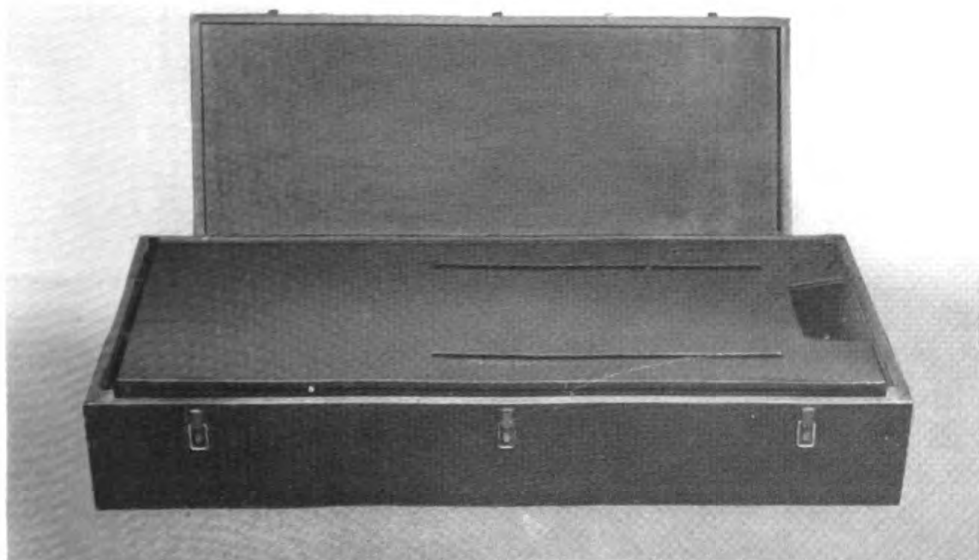
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10. United States Naval Hospital No. 211467.



Lightweight Film-Cassette Changer¹

RADIOLOGISTS, especially those on duty with the armed forces, will be interested in the new lightweight film-cassette changer for taking stereoscopic views of the human chest which has been developed for military field use by the Engineering Development Division of the Army-Navy Medical Procurement Office at its Fort Totten (N. Y.) laboratories.

The new apparatus weighs only 75 pounds, as compared with currently available commercial models which range from 370 to 700 pounds, and has a volume of only 4.6 cubic feet. Being light and compact, it can be fitted in a specially constructed case for air transport or can be conveniently hand-carried by two men (fig. 1).



—Army Signal Corps photo.

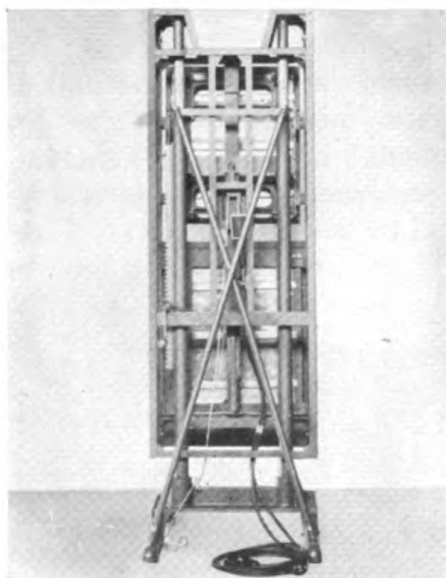
Figure 1.

¹ From the Public Information Office, Army-Navy Medical Procurement Office, Brooklyn, N. Y.

The lightweight construction has been attained by a unique design which eliminates the use of the usual heavy counterweights. Though it was necessary to employ 10 pounds of lead in construction of the conventional protective screen, further weight reduction has been achieved by the use of lighter metals elsewhere, principally aluminum.

The unit has a demountable base which is easily removed and, in order to simplify its manufacture for the armed forces, standard shapes of metal tubes, angles, channels, and sheets were used in its construction (fig. 2).

The cassette-changer mechanism is gravity-operated and is provided with both a magnetic and manual release which shifts the cassettes in $1\frac{1}{2}$ seconds. The apparatus is so rigidly constructed that it is entirely free from vibration at the end of the shift period and the second exposure can be made immediately (fig. 3).



—Army Signal Corps photo.

Figure 2.



--Army Signal Corps photo.

Figure 3.

Technicians at the Engineering Development Division are now working on a field-type stereoscopic film viewer which will be a companion apparatus to the new cassette changer.



X-Ray Diagnostic File System¹

JOHN P. WOOD, *Captain (MC) U. S. N.*

THIS report is preliminary in nature and is intended to stimulate interest rather than to present the solution of a problem. A x-ray diagnostic file system is necessary for teaching, reviewing, and the study of hospital material by the radiologist and other members of the staff. The requirements for residency type training approval demand such a file. As no system adapted to naval use has been proposed, the literature has been reviewed in a search for the best suited method. Hodges and Lampe (1) proposed an excellent filing system which is considered too complex for Navy use with its ever-changing personnel. The modification of the Hodges and Lampe system by Zwaluwenburg (2) offers little simplification. Gillespie (3) reported an ingenious method of utilizing a marginal punch card sorting device, but it necessitates considerable changes from present methods of record keeping and requires a specially prepared form. Walker (4) proposed the use of the Standard Nomenclature of Disease. Despite all the good features she points out, the Standard Nomenclature does not seem suitable as an x-ray filing system. The Navy Diagnostic Nomenclature has been considered and eliminated as unsuitable. Use of the terminology, however, is definitely indicated for reasons of uniformity and clarity. Sussman's (5) filing system was selected as the simplest and has been used for the past 18 months.

The system reported here has no claim to originality. It is an adaptation of Sussman's filing system based on our day-to-day experience. There has been so little change that it can hardly be considered a modification. Likewise, its use has required practically no change in the record procedures of the department. It is believed to be general practice in the Navy to file the films in numerical sequence, usually by the calendar year, and to file the reports under the names of the patients which are arranged in alphabetical order. Thus a simple but effective cross-record file is formed. A daily log or journal registering the date, x-ray serial number, name, rate, ward or other

¹From the U. S. Naval Hospital, U. S. Naval Training Center, Great Lakes, Ill.

source of patient, referring medical officer, part examined, and in some instances a record of the number and sizes of films used, completes our departmental records. These records are made and maintained by the hospital corpsman at the x-ray appointment desk and the typist or departmental secretary.

THE DIAGNOSTIC FILE

The diagnostic file is merely an addition to the foregoing procedures. There is the fundamental difference that the file determination must be made by the roentgenologist rather than by clerical personnel. And there is the rub, for time and effort is required. It is our firm conviction, however, that the relatively small amount of time and effort expended will amply repay the roentgenologist by stimulation to orderly thinking and constantly bringing to mind the pathological background of roentgen diagnosis.

The materials used are a copy of Sussman's Filing System, a visible index file, and a supply of Navy Hospital Case Record Cross-Index Cards, Navmed 1178. Doctor Sussman generously supplied the necessary reprints. It was found that they literally were worn out by daily use. A floor model card file was available. While not deliberately chosen, this type of file supplies adequate but not excessive space and provides the desirable feature of mobility. The Navy cross-index card affords a readily available form of convenient 8- by 5-inch size, with a space at the bottom for the visible title and numerous adequately sized spaces in which to place the file numbers. Both sides of the card are used.

OPERATIONAL TECHNIC

The file may be started at any time, the sooner started the sooner the benefits. Only the main heading cards are prepared in advance. All other cards are prepared as the subject is encountered in interpretation. We have found it most convenient for one of the junior medical officers in the department to "man the file" by looking up the diagnosis in the reprint and entering the file number on the proper card, or making a memorandum for the secretary to type up the necessary new card later. If no junior medical officer is available, two alternates are suggested, either the roentgenologist jot down the diagnosis and serial number for filing after interpretation is completed, or the roentgenologist make the file entries when signing the typed reports for the day. An attempt to make the entries during interpretation without assistance will be found too time-consuming in a busy department.

One obstacle has been encountered as the result of annual serial numbering of patients instead of a continuous serialization without regard to years. Unless the preceding year's entry is obliterated, duplication will result. It is our purpose to abandon annual serialization in favor of continuous serialization. Probably sooner or later a system providing a hospital admission serial number for each individual patient to be used throughout the hospital will be instituted in our Navy hospitals as is being done in many civilian hospitals. Such an eventuality offers no difficulty to our filing systems.

As Sussman (5) and other authors have pointed out, no one listing of diagnoses will suit all hospitals, as each will have different proportions of the various types of patients. For example, we had to greatly expand the fracture section while our cardiac section has shown relatively little development. Flexibility is probably the most important feature of this system.

A note of forbearance is also in order. Time after time we have had difficulty in finding where a diagnosis fits in this file, and have expressed the opinion that anyone could devise a more logical file. Just try it!

The following listings have been developed over a period of 18 months and are believed to just about cover the current requirements of our hospital. Now diagnoses now are added occasionally. As Walker (4) emphasized, a working file is never static but ever expanding. There will be entries from time to time in response to different techniques and procedures and to the ever-changing fads and fancies of medicine. Card titles have been made and spaced to facilitate finding. Another aid is for each main heading card (—0) to be colored pale green, either by using colored cards or, as was done at this hospital, by painting the title portion of the white card with green ink. Card titles were spaced according to the number of digits to the right of the decimal point. When a cipher appeared to the right of the decimal point the title was typed in all capitals and spaced $3\frac{1}{2}$ inches from the cipher; when one digit appeared to the right of the decimal point the title was spaced approximately 1 inch from the figure; when two digits appeared to the right of the decimal point the title was spaced $1\frac{1}{2}$ inches from the figures; and when three digits appeared to the right of the decimal point the title was spaced approximately 2 inches from the figures. Figures preceded by an asterisk are slide titles; each major division has a separate slide in the file.²

²Space does not permit printing these titles spaced as they appear on the cards.

- | | | | |
|-------|-----------------------------------|--------|--|
| *10.0 | URINARY TRACT | 27.3 | Patent interventricular septum |
| 10.0 | NORMAL | 27.5 | Patent ductus arteriosus |
| 11.0 | CONGENITAL ANOMALIES | 28.0 | AORTA |
| 11.1 | Position | 28.321 | Thoracic |
| 11.11 | Ptoxis | 28.33 | Displacement |
| 11.12 | Mobility | 28.4 | Atherosclerosis |
| 11.2 | Number | 29.0 | PULMONARY ARTERY |
| 11.21 | Absence one or both | 29.9 | Pericardium |
| 11.3 | Form | 29.91 | Effusion |
| 11.31 | Horseshoe kidney | 29.93 | Adhesive pericarditis |
| 11.4 | Structure | 29.96 | Cardiac failure |
| 11.41 | Hypoplastic | 29.97 | Aneurysm, peripheral vessels |
| 11.43 | Polycystic | *30.0 | BONES AND JOINTS LESS FRACTURES |
| 11.5 | Renal pelvis and ureters | 30.0 | NORMAL |
| 11.51 | Incomplete double ureter | 31.0 | NORMAL DEVELOPMENT (see Age Atlas for immatures) |
| 11.6 | Ureteral anomalies | 32.0 | DISEASES DUE TO PRENATAL INFLUENCE |
| 11.61 | Ureteral anomalies of the lumen | 32.1 | Congenital absence |
| 11.65 | Anomaly of implantation | 32.2 | Congenital partial absence |
| 12.0 | HYDRONEPHROSIS | 32.6 | Fusion defects |
| 12.1 | Calculus | 32.7 | Congenital synostosis |
| 12.2 | Noncalculus | 33.0 | TRAUMA |
| 12.21 | Pressure of aberrant vessel | 33.2 | Aclavio-clavicular separation |
| 12.22 | Post-operative | 33.4 | Excessive callus |
| 13.0 | INFECTION | 33.5 | Loss of substance (traumatic) and amputation |
| 13.1 | Pyelitis | 33.9 | Faulty union |
| 13.11 | Acute and subacute | 33.93 | Bone graft, donor site |
| 13.13 | In children | 34.0 | INFECTION |
| 13.14 | In pregnancy | 34.1 | Bone abscess |
| 13.3 | Ureter | 34.3 | Osteomyelitis |
| 13.35 | Hydroureter | 34.31 | Acute |
| 13.5 | Renal suppuration | 34.32 | Chronic |
| 13.52 | Carbuncle | 34.61 | Congenital syphilis |
| 13.7 | Tuberculosis | 35.0 | INTOXICATION |
| 14.0 | CALCULUS | 36.0 | CIRCULATORY DISTURBANCES |
| 14.2 | Caliceal | 37.0 | DISTURBANCES IN INNERVATION |
| 14.3 | Pelvic | 38.0 | DISORDER OF METABOLISM, GROWTH, OR NUTRITION |
| 14.4 | Ureteral | 38.1 | General metabolism |
| 14.6 | Prostatic | 38.12 | Dysuse atrophy |
| 15.0 | NEW GROWTH | 38.13 | Sudek's atrophy |
| 16.0 | TRAUMA | 38.4 | Vitamin deficiency |
| 17.0 | NEUROLOGIC LESION OF BLADDER | 38.41 | Scurvy |
| 18.0 | BLADDER | 38.42 | Rickets |
| 19.0 | URETHRA | 38.6 | Involution diseases |
| *20.0 | HEART | 38.61 | Senile osteoporosis |
| 20.0 | NORMAL | 39.0 | DISEASE OF UNKNOWN CAUSE |
| 21.0 | DISPLACEMENT | 39.1 | Osteochondritis |
| 21.4 | Pulmonary fibrosis | 39.11 | Vertebra |
| 22.0 | CHRONIC VALVULAR DISEASE. | 39.14 | Tarsal bones |
| 22.1 | Mitral Stenosis and Insufficiency | 39.15 | Tibia tuberosity |
| 22.8 | Cardiac failure | 39.16 | Head and neck of femur |
| 23.0 | HYPERTENSION | 39.19 | Osteochondritis Dissecans |
| 23.1 | Essential | 39.2 | Epiphyseolysis (slipped epiphysis) |
| 23.4 | Cardiac failure | *40.0 | BONES AND JOINTS LESS FRACTURES |
| 24.0 | MYOCARDIAL DISEASE | 40.0 | JOINTS |
| 24.1 | Coronary occlusion | 40.1 | Anomalies |
| 24.7 | Cardiac failure | 40.12 | Hallux valgus |
| 25.0 | SYSTEMIC DISEASE | | |
| 25.4 | Hyperthyroidism | | |
| 26.0 | INFECTIOUS DISEASES | | |
| 26.1 | Acute rheumatic fever | | |
| 26.2 | Subacute bacterial endocarditis | | |
| 27.0 | CONGENITAL | | |
| 27.1 | Dextrocardia, Right-sided aorta | | |
| 27.2 | Coarctation of aorta | | |

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|--------|---|--------|--|
| 40.13 | Pes Planus | 45.2 | Hematoma |
| 40.14 | Pes Cavus | 45.4 | Vessels |
| 40.2 | Infection | 46.0 | DEFORMITY OF UNDETER- |
| 40.21 | Septic arthritis | | MINED ORIGIN |
| 40.22 | Arthritis of rheumatic fever | 46.1 | Skull |
| 40.23 | Rheumatoid arthritis | 46.2 | Thorax |
| 40.27 | Ankylosis | 46.41 | Coxa vara |
| 40.3 | Hypertrophic arthritis | 46.42 | Coxa valga |
| 40.31 | Combined atrophic and hypertrophic | 46.6 | Shoulder (bilateral) |
| 40.5 | Traumatic arthritis | 46.7 | Rib defects |
| 40.7 | Loose bodies | 47.0 | SOFT TISSUES |
| 40.8 | Disturbances in joint meniscus | 47.3 | Gas |
| 40.98 | Bursal calcification | 48.0 | ANGIOGRAPHY |
| 40.99 | Synovitis | *33.1 | FRACTURES |
| 41.0 | SYSTEMIC BLOOD DISTURBANCES | 21 | SKULL |
| 42.0 | TUMOR | 211 | Frontal bone, generally |
| 42.1 | Benign | 212 | Parietal bone |
| 42.11 | Chondroma | 213 | Temporal bone, generally |
| 42.12 | Enchondroma | 216 | Nasal bone : bones of nose |
| 42.13 | Osteochondroma | 217 | Zygomatic |
| 42.14 | Osteoma | 218 | Maxilla |
| 42.15 | Bone cyst | 219 | Mandible |
| 42.16 | Myositis ossificans and heterotopic bone | 22 | BONES OF SPINE AND TRUNK |
| 42.17 | Hemangioma | 220 | Vertebral bodies |
| 42.2 | Giant cell tumor | 221 | Spinous process |
| 42.3 | Primary malignant | 222 | Lamina and articular processes |
| 42.32 | Osteogenic sarcoma | 226 | Clavicle |
| 42.34 | Myeloma | 228 | Ribs |
| 42.4 | Metastases | 229 | Innominate bone |
| 42.41 | Osteoclastic | 22X | Pelvis |
| 43.0 | SPINE | 23 | BONES OF EXTREMITIES |
| 43.1 | Congenital and developmental | 230 | Humerus |
| 43.11 | Spina bifida | 231 | Radius |
| 43.12 | Fusion of vertebral bodies | 232 | Ulna |
| 43.13 | Absence of part or all of body | 233 | Carpal bones |
| 43.15 | Sacralization | 234 | Metacarpal bones and phalanges.
(These should be separated.) |
| 43.16 | Spondylolisthesis | 235 | Femur |
| 43.17 | Kyphosis and scoliosis | 236 | Patella |
| 43.18 | Osteochondritis (Scheuermann's) | 237 | Tibia |
| 43.19 | Prespondylolisthesis | 238 | Fibula |
| 43.2 | Disturbance of nucleus pulposus | 239 | Tarsal bones |
| 43.21 | Herniation into body (Schmorl's node) | 23X | Metatarsal bones and phalanges.
(These should be separated.) |
| 43.22 | Retropulsion | *33.2 | DISLOCATIONS |
| 43.3 | Increased lumbosacral angle | 24 | JOINTS |
| 43.5 | Spinal cord tumor | 241 | Vertebral joints |
| 43.6 | Myelograph, nontumor | 242 | Shoulder |
| 43.7 | Fusion, surgical | 243 | Elbow |
| 44.0 | SKULL | 244 | Wrist |
| 44.1 | Pneumograms | 245 | Joints of hand and fingers. |
| 44.111 | Encephalogram | 247 | Hip |
| 44.112 | Ventriculogram | 248 | Knee |
| 44.13 | Tumor or abscess | 249 | Ankle |
| 44.14 | Hydrocephalus | 24X | Joints of foot and toes |
| 44.144 | Internal | *50.0 | ABDOMEN |
| 44.8 | Calcifications | 51.0 | ABDOMEN |
| 44.82 | Choroid | 51.02 | Masses |
| 44.83 | Pineal | 51.04 | Hysteroqram |
| 44.84 | Falx | 51.05 | Calcifications |
| 44.9 | Miscellaneous | 51.06 | Pregnancy |
| 44.94 | Hydrocephalus | 51.061 | Pregnancy before term |
| 45.0 | CALCIFICATIONS | 51.062 | Pregnancy—normal pelvilemtry—
unusual fetal position |
| 45.1 | Ligaments and tendons. (For bursa see 40.98) | 51.064 | Abnormal fetus |
| | | 51.065 | Multiple fetuses |
| | | 51.07 | Foreign body |

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|--------|--------------------------|--------|---|
| 51.09 | Pneumoperitoneum | 75.32 | Ulcerative colitis |
| 51.10 | Ascites | 75.325 | Clinically positive. No characteristic roentgen findings. |
| 51.11 | Psoas abscess | 75.33 | Diverticulitis |
| 51.2 | Hepatosplenomegaly | 75.37 | Appendiceal abscess |
| 52.0 | GALL BLADDER | 75.4 | Neoplasm |
| 52.1 | Normal variations | 75.42 | Polyposis |
| 52.3 | Abnormal variations | 75.44 | Malignant neoplasm |
| 52.31 | Poor visualization | 75.443 | Transverse |
| 52.32 | No visualization | 75.444 | Hepatic flexure |
| 52.38 | Abnormal emptying | 75.5 | Post-operative |
| 52.4 | Gall stones | 76.0 | FOREIGN BODY |
| 52.41 | Transparent stones | 76.1 | Large bowel |
| 52.42 | Calcified stones | *80.0 | CHEST |
| 52.422 | Fundus | 80.0 | TRACHEA |
| *60.0 | SINUSES, MASTOIDS, NECK | 81.0 | BRONCHUS |
| 61.0 | SINUSES | 81.1 | Bronchiectasis |
| 61.1 | Normal variations | 82.0 | PNEUMONIA |
| 61.2 | Clouded sinuses | 82.1 | Lobar |
| 61.4 | Polyp | 82.2 | Bronchopneumonia |
| 62.0 | MASTOIDS | 82.7 | Atypical, primary |
| 62.1 | Clouded mastoids | 83.0 | TUBERCULOSIS |
| 62.2 | Destruction | 83.1 | Primary complex |
| 62.4 | Sclerosis | 83.11 | Primary complex—active |
| 62.7 | Post-operative | 83.12 | Primary complex—healed |
| 62.8 | Normal variations | 83.2 | Early infiltrate reinfection |
| 62.9 | Cholesteatoma | 83.21 | Early infiltrate without dissemination |
| 63.0 | NECK | 83.22 | Early infiltrate with dissemination |
| *70.0 | GASTRO-INTESTINAL TRACT | 83.23 | Pneumonic |
| 71.0 | ESOPHAGUS | 83.3 | Cavity |
| 71.1 | Congenital abnormalities | 83.32 | Single |
| 71.2 | Extrinsic pressure | 83.33 | Multiple |
| 71.3 | Diverticula | 83.35 | With dissemination |
| 71.6 | Varicosities | 83.4 | Chronic |
| 71.8 | Cardiospasm | 83.41 | Chronic fibroid |
| 72.0 | STOMACH | 83.42 | Healed fibrotic |
| 72.2 | Diaphragmatic hernia | 83.5 | Millary |
| 72.21 | Short esophagus | 83.7 | Fibrocasseation |
| 72.23 | Esophageal | 84.0 | LUNG ABSCESS |
| 72.25 | Eventration | 85.0 | LUNG NEOPLASM |
| 72.4 | Miscellaneous | 85.1 | Metastatic |
| 72.41 | Diverticulum | 85.11 | Solitary nodule |
| 72.42 | Hypertrophic rugae | 85.12 | Multiple nodules |
| 72.5 | Ulcer | 85.2 | Primary |
| 72.6 | Neoplasm | 85.4 | Bronchogram |
| 72.62 | Malignant | 86.0 | LUNG |
| 72.7 | Pyloric stenosis | 86.1 | Atelectasis |
| 72.9 | Post-operative | 86.11 | Massive |
| 72.91 | Gastroenterostomy | 86.13 | Lobar |
| 72.92 | Subtotal gastrectomy | 86.15 | Focal (Fleischner lines) |
| 72.93 | Gastrojejunal ulcer | 86.2 | Cystic disease |
| 72.99 | Post-vagotomy | 86.4 | Emphysema |
| 73.0 | DUODENUM | 86.5 | Fibrosis |
| 73.1 | Ulcer | 86.51 | Interstitial |
| 73.12 | Deformity | 86.52 | Pneumoconiosis |
| 73.13 | Crater | 86.6 | Millary calcification, cause undetermined |
| 73.4 | Post-operative | 86.7 | Infaret |
| 73.5 | Diverticula | 86.9 | Normal variations |
| 73.6 | Extrinsic pressure | 86.922 | Azygos lobe |
| 74.0 | SMALL INTESTINE | 87.0 | GENERAL DISEASES |
| 74.3 | Displacement | 87.1 | Boeck's sarcoid |
| 74.5 | Obstruction | 87.2 | Hodgkin's disease |
| 74.52 | Acute | 87.3 | Leukemia |
| 74.53 | Ileus | | |
| 75.0 | COLON | | |
| 75.2 | Diverticulosis | | |
| 75.3 | Inflammation | | |

88.0	PLEURA	92.13	Neoplasm
88.1	Pleuritis (acute)	92.14	Subcutaneous hematoma
88.2	Effusion	92.3	Breast
88.21	Simple	92.4	Ribs including cervical (see 46.7)
88.22	Encapsulated	92.41	Rib resection, thoractomy, etc.
88.33	Interlobar	94.0	MEDIASTINUM
88.4	Pneumothorax	94.01	Thymus
88.41	Hydropneumothorax	94.02	Lymph glands, enlarged or calcified
88.42	Pyopneumothorax	94.3	Neoplasm
88.43	Hemothorax and hemopneumothorax	94.31	Metastatic neoplasm
88.431	Traumatic	94.32	Primary neoplasm
88.432	Spontaneous	94.33	Lymphadenopathy, cause unknown
88.8	Adhesions	94.34	Cyst
90.0	DIAPHRAGM	94.35	Thyroid
90.1	Hernia (see 72.2)	94.4	Emphysema (see 86.4)
90.2	Eventration (see 72.25)	*100.0	MISCELLANEOUS
90.4	Subphrenic abscess	100.1	Confusing appearance
90.5	Pneumoperitoneum (see 51.09)	100.12	Phleboliths
91.0	CLINICAL	100.2	Technics, special and unusual
91.3	Operations	100.3	Foreign bodies
91.31	Pneumothorax	100.31	Head
91.33	Thoracoplasty	100.32	Eye
91.4	Radiotherapy	100.33	Trunk
92.0	CHEST WALL	100.34	Extremities
92.1	Subcutaneous tissues		

AGE ATLAS

In addition to, but separate and distinct from the diagnostic file, we have devised a method of compiling an atlas of child anatomy. Most radiologists outside of children's hospitals have rather limited experience with children. Accordingly, there is a need to keep films of different anatomical regions at different ages available for reference and comparison. All films made on patients under 17 years of age are entered in this file. The top age limit was set because of the large number of patients admitted at and above 17 years of age. By experience we found it necessary to make separate cards for infants. Each infant card has one line for each successive age in months, beginning with the newborn at 0 months and utilizing the remaining 19 lines so that there are monthly divisions almost up to 2 years of age. A second card is then prepared for each anatomical part in the file for children 2 through 16 years of age. Only one slide in the file is required for the atlas. For codification and tabulation purposes, although not required in filing, the age of the child can be incorporated with the file number by adding a decimal followed by zero and the age in months, or the age in years without the preceding zero; for example, (1) 37.12—knee of 12-year-old child, (2) 40.01—chest of 1-month-old infant. All these cards carry the notation "infant" or "Age 2-18 years," as appropriate, in addition to the numerals and anatomical titles, as illustrated in the first category.

A10	Bones of the skull	Infants Age 2-18 years	A30	Bones of Extremities
A10.1	Sinuses		A31	Humerus
A10.2	Mastoids		A32	Elbow
A20	Bones of the spine and trunk		A33	Forearm
A21	Cervical Vertebrae		A34	Wrist
A22	Thoracic Vertebrae		A35	Hand
A23	Lumbar Vertebrae		A36	Femur
A24	Sacrum and Coccyx		A37	Knee
A25	Shoulders		A38	Leg
A26	Pelvis and Hips		A39	Ankle and feet
			A40	Chest
			A50	Abdomen

SUMMARY

After investigating various x-ray diagnostic file systems the Sussman Filing System was found easily adapted to naval use and adequate. A children's anatomical atlas film file system is described. The recital of our experience is presented as a stimulus for the development of a standard Navy x-ray diagnostic filing system and not as the end result itself. It is believed that only by the cooperation of various Navy radiologists can the best system be evolved.

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Recent Advances in Medicine and Dentistry

DYNAMIC advances have been made in clinical medicine and in scientific fields allied to medicine in the past few years. In anatomy Angel (52) advanced the knowledge of the action of the temporomandibular joint. In microscopic anatomy Green (53) described a neurovascular zone in the hypophyseal stalk not previously described. He noted that the sheaths of the hypophyseal-portal vessels consisted of ordinary connective tissue in which was contained smooth muscle cells, collagen, and reticular fibers, and that the structure of the vessels indicated that the blood flow is from above downward.

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The achievement of Trueta and his coworkers is discussed in the editorial in this issue of the BULLETIN. Their discovery of the renal shunt will do much toward rationalizing the therapy of acute renal insufficiency and hypertension and perhaps other conditions. Masson in 1937 (64) showed that a similar vascular shunt under independent control of the glomus exists in the skin.

The discovery of chloromycetin (56) in the field of chemotherapeutics is of great value. A crystalline substance, obtained by purification and concentration of liquid cultures of a new strain of *Streptomyces*, this antibiotic has been shown to be highly effective against typhoid fever (57), scrub typhus, typhus fever, and brucellosis (8) (59).

The most recently developed antibiotic of value is aureomycin. Obtained from a *Streptomyces* it shows marked therapeutic activity against the rickettsiae, brucellosis (60), and certain viruses, especially lymphogranuloma venereum (61) and it may be of value in the treatment of infections with penicillin- or streptomycin-resistant organisms (62).

Gamma globulin is noted to be of value in the treatment of infectious hepatitis and as a prophylaxis in measles, chicken pox, and scarlet fever.

Radioisotopes have been found to be of little value as chemotherapeutic agents in infections or cancer. However radioactive phosphorous P_{32} does bring a prompt and favorable response in Polycythemia vera (63) and is considered by some to be the treatment of choice. Only a few instances of successful treatment of carcinoma of the thyroid have been reported, for radioactive iodine uptake by carcinoma of the thyroid is insignificant except in metastatic lesions manifesting thyrotoxicosis (63).

Studies of the carcinogenesis of the liver with azotoluene and other substances have stressed the importance of vitamin B deficiency, while other studies indicate the part played by this vitamin in hepatic cirrhosis.

Noteworthy in surgery is the work of Beck and his group (54) in revascularization of the heart in coronary heart disease. A segment of the brachial artery was used to anastomose the aorta and the coronary sinus. The clinical result was excellent. Gross and his coworkers (55) use segments of arteries (stored in electrolyte solution containing glucose, serum, penicillin, and streptomycin) to anastomose the aorta and the pulmonary artery, in establishing a shunt for overcoming symptoms in patients with tetralogy of Fallot, and as grafts for the correction of coarctation of the aorta.

Berylliosis is now recognized as an entity in the field of pulmonary pathology. Beryllium or glucinium is a rare metal obtained from

beryllium aluminum silicate. This metal is used in the manufacture of copper alloys; the salts of the metal are incorporated in the phosphorescent powder used in lining fluorescent tubes, and also are used in atomic energy. The handling of beryllium compounds is attended with the risk of contracting dermatitis, granulomatous ulcers of the skin, an acute pneumonitis, or else a chronic respiratory disease (berylliosis) in which there occurs marked loss of weight, cough, dyspnea, fatigability, without fever or alteration of the sedimentation rate, and with negative findings in the bronchial secretions. The onset of the pneumonitis may be delayed as long as 3 years after the exposure to beryllium. The pathologic lung changes noted are diffuse fibrosis with hyalinized strands of collagen often in dense patches replacing the alveoli (22). The extensive pulmonary disease which ensues is often diagnosed as miliary tuberculosis or sarcoidosis. Punch biopsy specimens from the liver show granulomatoma containing epithelioid giant cells. There is no evidence of liver dysfunction. Granulomatoma may occur in the skin lesions which appear after cuts with broken glass from fluorescent lamps containing beryllium compounds or may occur spontaneously in berylliosis. These lesions are also found in the lungs, spleen, and hilar lymph nodes. The histologic features of the granulomatoma resemble that of sarcoidosis. Beryllium may be detected in granulomata by the spectroscope.

CANCER¹

Rhoads notes that injections of a crude extract which had many of the properties of folic acid inhibited the growth of transplanted sarcoma in mice. Later the same activity was shown by pteroyltriglutamic acid, a conjugate of folic acid, although folic acid itself was without value when tested under similar conditions. The conjugates of pteroyltriglutamic acid (folic acid), of which a large variety were made available by synthetic procedures, include aminopterin and a-methopterin. The first seems to have little preferential injurious effect upon neoplastic lesions in man or animals, while the latter seems to exert some preferential injurious effect on certain types of neoplasm. These conjugates of folic acid act by interfering with the metabolism of nucleic acid. The agents which cause cancer seem to produce their effects by inducing mutations of the chromosomes, the nucleic acid containing structures in the cell.

In experimental leukemia in mice, and in transplanted sarcoma 180,

¹ Recent Advances in Treatment of Cancer. From text of an address given at the Twenty-first Graduate Fortnight of the New York Academy of Medicine, 4 October 1948, by Cornelius P. Rhoads, M. D., with the kind permission of the author.

a-methopterin at dose levels readily tolerated by animals shows an inhibiting effect in both conditions and also exhibits evidence of growth restraint in the sensitive neoplasms in the human. While folic acid deficiency inhibits the formation of leukocytes it produces a rapid hematologic relapse when given to patients with chronic leukemia. Aminopterin has a pronounced leuotoxic effect on both the neoplastic cell and the normal cell.

Rhoads states that—

aminopterin is an experimental drug of great interest. In man, however, except possibly in acute leukemia in children, there is little differential between its effect on neoplastic cells as compared to normal cells. That it has an injurious action on the leukocytes of leukemia is a fact beyond question, but more data will be required before we can conclude that it will regularly restore the patients to health.

He cautions that—

great care must be used in setting up the experiments and evaluating the results. Certain cardinal points must be borne in mind. The first is that results must be expressed in terms of a ratio between the primary toxicity of the compound employed and inhibition of tumor growth effected. It is not enough simply to state that one compound is less or more toxic than another. The second principle is that a spectrum of different tumors of varying sensitivity must be employed in testing, since there is very considerable variation in their response to growth-inhibiting agents. Finally, response of the tumor in terms of cytological injury must be compared with that of the tissue in the body most sensitive to inhibition of growth, notably the lymphatic tissue and the bone marrow.

He notes that in experimental animals "4-amino N¹⁰-methyl pteroyl-glutamic acid (a-methopterin) is associated with more definite evidence of a restricting effect upon the growth of neoplastic tissue. With this compound, both in experimental leukemia in mice and transplanted sarcoma 180, a well-defined inhibition of growth of the neoplastic cells can be demonstrated at dose levels which are under those tolerated by the animals Rhoads concludes that—

There is a suggestion furthermore, that in human beings some objective evidence of growth restraint of sensitive neoplasms can be obtained, although much further data will be required before any final conclusion is justified.

The experience of Memorial Hospital, Sloan-Kettering Institute, with aminopterin and a-methopterin can be summed up with the statement that the first compound seems to have little preferential injurious effect on neoplastic, compared with sensitive normal cells in man or animals. The second, however, seems to exert some preferential injury to certain types of sensitive neoplasms.

The work presented is one of the most interesting studies now under way in the pathologic physiology of neoplasms. It is of no great moment today whether this or that compound has perceptible, or more than perceptible, effects on leukemia. It is of very great moment, however, that in the field of compounds which may well interfere with the formation or metabolism of nucleic acid, substances are at hand which poison certain neoplastic cells, even though this effect be a weak one.

DERMATOLOGY AND SYPHILOLOGY

Further experimental and clinical observations have been made on—

The profound effects of environmental temperature and humidity upon many diseases, particularly in relation to sweat-pore plugging, to prickly heat, and to itching and itching dermatoses.

The observations on the effects of radioactive isotopes, e. g., phosphorus (P_{32}), upon the skin and upon skin lesions, including skin cancer. (Low-Beer's technic consists of placing a small piece of filter paper saturated with sodium radio phosphate P_{32} , over the lesion and leaving it there for the time calculated to administer the required dose of beta rays to the lesion.)

The use of the electron microscope in finding spherical and thread-like structures in epidermal cancer cells, and in the study of the structure and the identification of certain viruses, including those causing herpes simplex, herpes zoster, and varicella, and the demonstration that the two named last are identical in structure.

The demonstration of the therapeutic value of certain sulfones—e. g., promizole, promin, and diasone in leprosy; of aureomycin in lymphogranuloma venereum; and streptomycin in granuloma inguinale.

The first international agreement upon a uniform classification and terminology of leprosy, into three forms: (*a*) lepromatous; (*b*) undetermined; and (*c*) tuberculoid.

The use of the electron microscope in demonstrating the characteristic structures in the treponemes of syphilis and those of pinta; and the differences in the morphology of these two treponemes.

The introduction of the "cardiolipin" extract as an antigen for serologic tests; and the approach to the recognition of the actual chemical nature of the antigen concerned in the serologic reaction of sera of syphilitic persons.

The further studies on penicillin, with the recognition of the importance of repeated peak blood levels in contrast to continuous levels.

The introduction of means for retarding absorption of penicillin from the intramuscular depots, such as penicillin in oil and beeswax and procaine penicillin; and for retarding renal excretion of penicillin by caronamide.

The further study of the effects of podyphyllin and podyphyllotoxin upon the division of epithelial cells and upon their nuclear structures and mitotic arrest.

The continued study of various antihistaminic drugs in itching and other dermatoses, in particular, the expansion of their clinical uses by topical application and studies of their bizarre and variable side effects.

NEUROLOGY

Putnam et al. (1) review evidence that multiple sclerotic plaques arise as a result of venular thrombosis and report encouraging results in treating 25 cases of the remittent form with the anticoagulant dicoumarin. However, 16 patients with chronic progressive disease failed to respond.

Franklin and Brickner (2) propose a hypothesis that lesions throughout the central nervous system in multiple sclerosis are caused by diminution of blood supply, secondary to arteriolar spasm. Eighteen patients observed showed constrictions of some of the arterioles of the retina. In most instances, fast-acting vasodilator drugs (amyl nitrite and papaverine hydrochloride) caused prompt temporary reduction of scotomas. No explanation of the cause of the vasospasm was given.

The Council on Pharmacy and Chemistry (American Medical Association) (3), reports 91 cases of tuberculous meningitis treated with streptomycin; 33 patients surviving. Although 10 are free from bacteriological and clinical evidence of active central nervous system infection, some hope is offered in a heretofore fatal process.

Fabing (4), discusses 80 cases of combat blast injury and offers a successful method of therapy (pentothal narco-hypnosis with rapid awakening with intravenous nikethamide) which proved of value in 90 percent of the patients.

One of the most significant advances in the field of epilepsy has been the work of the Gibbs (5), who have found up to 90 percent positive spike discharges during sleep records of the epileptic.

Drug therapy of epilepsy, both tridione and mesantoin have established places beside dilantin and phenobarbital as valuable therapeutic weapons. Lennox (6) reported that 83 percent of 166 patients were benefited in therapy of petit mal. It was unsuccessful in dealing with grand mal seizures.

Kozol (7) continues to report on the effectiveness of mesantoin on grand mal and psychomotor seizure but it is ineffectual in petit mal. He believes it to be less toxic than dilantin, although one case of aplastic anemia was recently reported (8).

Diagnostic Advances

Meyer (9), reports 17 percent of 500 neurological normals showed perceptible anisocoria while 36 percent presented inequality of palpebral fissures.

Progress in diagnostic arteriography continues with reports of its simplicity and harmlessness coming from both European and Ameri-

can investigators. Lindgren (10) of Stockholm describes a simple technique for intracarotid injection without skin incision. Its use in diagnosis and localization of tumors, aneurysm, and arterial occlusion is described by Hodes et al. (11).

Following tractotomy of bulbospinal tract of the trigeminal nerve in 4 patients, Brodal's (12) observations indicate that fibers conducting pain for the facial, glossopharyngeal, and vagus nerves join the pain fibers of the trigeminal nerve and accompany them in the descending root of the trigeminus. It appears from these observations that neuralgias of the seventh, ninth, and tenth nerves may be successfully treated by tractotomy, thereby eliminating intracranial operative complications and complete anesthesia that accompanies peripheral nerve section.

Electro-encephalography

In 240 cases of encephalitis, Gibbs and Gibbs (13) found that abnormality was often focal and correlated with general severity of symptoms. However, the only postencephalitic syndrome correlating highly with electro-encephalographic abnormality was the presence of convulsions.

Kaufman et al (14) found that intravenous metrazol gave satisfactory focal activation in 44 percent of 97 patients with post-traumatic epilepsy and a higher percentage on repeated testing. Electro-encephalographic alterations included focal slow waves or spikes. This technique was used to localize epileptogenic foci prior to neurosurgery.

Dynes (15) found no distinctive difference between electro-encephalographs of normal waking state and hypnotic trance in 5 patients. Records showed no resemblance to the electro-encephalograph tracings of a sleeping person. This rather objective evidence confirms opinions of investigators who have claimed that hypnosis is not a sleep variant.

In a careful study of 51 selected patients with migraine headaches, Dow and Whitty (16) found that 60 percent had clearly abnormal records.

Schwab (17) indicates that the location and diagnosis of intracranial tumors and vascular lesions remains as one of the most useful applications of the electro-encephalograph. The general average of localization in centers throughout the world runs from 60 to 90 percent.

NEUROSURGERY

The outstanding achievements in neurosurgery have occurred in the fields of diagnosis and technical improvements in post-operative care.

In the field of diagnosis the electro-encephalogram is being perfected to include not only records obtained from electrodes placed on the scalp, but also on the exposed cerebral cortex. By comparing and coordinating the two procedures with the clinical findings, more accurate localization has been accomplished particularly in identifying any epileptogenic focus.

Angiograms made after injecting radiopaque substances into the carotid and vertebral arteries, permit the visualization of the intracranial arterial and venous vascular tree, thus adding another valuable diagnostic procedure in localizing and identifying obscure lesions of the brain.

Hemostatic agents such as oxidized cellulose, fibrin foam, and gel-foam have greatly aided in the control of hemorrhage. Oxidized cellulose is still being used and improved upon in many clinics and is filling the need under certain conditions. Because of the difficulty in obtaining fibrin foam, which is a product of blood fractionation, an accepted substitute called gelfoam has been manufactured from gelatin. This is being used either dry or saturated with bovine thrombin in the control of hemorrhage.

Cerebral edema occurring after the removal of intracranial lesions or following head injury, has been treated by dehydration and decompression. Serum globulin, one of the byproducts of blood fractionation, has been found to be an adequate substitute for plasma in the treatment of shock and also found to be of great benefit as a dehydrating mechanism in the treatment of cerebral edema.

Exploration of the contributing factor of the sympathetic nervous system to Parkinson's disease, has been made and injection and removal of the stellate ganglion has been tried in an attempt to control the progress of the disease. More time is needed for a true evaluation.

Injection of the stellate ganglion has been tried in cases of cerebral vascular accidents, in an attempt to relieve the paralysis by eliminating any vascular spasm which might be a contributing factor. Again, this procedure needs more time for a true evaluation.

The contributions of anesthesiology have increased the scope of operations in neurosurgery, as well as in all branches of surgery, and have aided in the care of the patient on the operating table as well as post-operatively. This applies not only to evaluation and use of new anesthetic agents and sedative drugs, but also to intravenous medication and oxygen therapy.

ADVANCES IN OPHTHALMOLOGY

There have been no new major developments in ophthalmology during the past 2 years, however, numerous contributions have been made to the scientific and clinical aspects of ophthalmology. Considerable emphasis especially has been placed on the various mani-

festations of glaucoma and several drugs to lower the elevated intraocular tension have been introduced.

Following the recommendations of a special board, the American Academy of Ophthalmology and Otorhinolaryngology has accepted the classification of primary glaucoma into narrow angle or shallow chamber glaucoma and wide-angle glaucoma, thus separating these two entirely different entities. The shallow-angle group is dependent on an angle blocking mechanism, and includes acute congestive glaucoma, chronic congestive glaucoma, and pupil dilatation glaucoma. The wide-angle glaucoma is known as simple glaucoma or primary compensated glaucoma, the cause of which has not been discovered, although considerable investigation is being made concerning this subject.

Contributions to the study of glaucoma and its treatment include: (a) The venous tension in eyes with simple glaucoma shows a definite correlation with the intraocular tension, the venous changes occur before changes in ocular tension, and indicating that the effect of pilocarpine is due to its influence on the retinal circulation (23); (b) a discussion on intracranial origin of glaucomatous optic atrophy by Magitot (24) who believes glaucoma is an affection of the diencephalon characterized essentially by vasomotor disturbances and comprised of psychic, sensory, and endocrine symptoms; the glaucomatous optic atrophy being descending not ascending. The vascular disorder leads to edema which affects the optic nerve and causes an increase in blood and interstitial fluids in the eye, resulting in ocular hypertension (24); (c) pupillography sheds some light on the mechanism of glaucoma; the reaction of the pupil to light varies according to the state of the autonomic nervous system, and is altered in some diseases of the central nervous system and is also altered in glaucoma, indicating neural factors in the pathogenesis of glaucoma (25); and (d) comparison of iurmethide with pilocarpine and eserine in treatment of primary glaucoma showed the former to be more effective in the higher tension groups than in the lower tension groups, when treatment with pilocarpine failed (26).

Very little has been offered in the treatment of external conditions of the eye. Beta irradiation has been reported to be definitely effective in vernal conjunctivitis, tuberculosis of the anterior segment, small benign tumor of the lids and conjunctiva, corneal ulcers, acne rosacea, keratitis, recent corneal scar with vascularization, for preventing superficial vascularization after keratectomy and keratoplasty, and for the prevention of recurrence of pterygium (34).

The use of sulfa drugs, penicillin, and streptomycin in ophthalmology has superseded many older methods of treatment. Ointments have been practically discarded, and thermal or chemical cauterization of

hypopyon ulcers is an outmoded procedure (27). The administration of penicillin with epinephrine and procaine solution subconjunctivally has been shown to be very efficacious, maintaining a good level in the aqueous of the anterior chamber for 6 hours (35). Another ideal antiseptic, in cases of acute and chronic infections of the conjunctiva, is sodium sulfacetamide in 30 percent solution. It has further advantage in that only rare sensitivity reaction occurs (29) (30).

No advance has been made in the treatment of sympathetic ophthalmia; however, the uveal pigment intracutaneous test for sensitivity has been shown to be of value as an adjunct to diagnosis and as an aid in determining the possibility of occurrence of sympathetic ophthalmia, following injury or operation (32).

Surgery of the eye has shown no remarkable advance. Improved technics in plastic surgery of the eye and adnexa have been reported. Reviews of large numbers of cases of retinal detachment have clearly shown the value of early surgery. Improved technics of certain eye muscle operations, especially those involving the superior oblique in vertical strabismus and the levator palpebrae superioris for ptosis, have been worthwhile contributions. The newer types of integrated implants and artificial eyes for use after enucleation and evisceration of the eye have been shown to have numerous advantages over the ordinary buried implant and the artificial eye. The integrated implant is a sphere with a device near the anterior pole, such as a ring or platinum mesh, to which the recti muscles are attached. More time will be required for evaluation (33).

In the studies of retinal detachment, the injection of saline through the pupil into the vitreous chamber appears to be of definite value in aphakic eyes when the retina fails to fall back to the choroid. It was also shown to be of some value through the nondetached retina in phakic eyes when flattening has not been obtained at surgery (28) (31).

ADVANCES IN OTORHINOLARYNGOLOGY

Many refinements and new advances were made in otorhinolaryngology particularly in rhinoplasty and in improvements in the technique for correction of anatomical defects of the nose and septum. Fomon and his group (42) devised a new operation for correction of the anteriorly dislocated and deviated septum, long a problem to the rhinologist. Much experimental work on fenestra healing and closure in monkeys has been done by Lindsay and the Chicago group (39).

Anatomy

Sicher (36), in a detailed study of the temporal bone has shown that there is a definite relationship between malocclusion and temporo-

mandibular damage. However, pressure in malocclusion is never directed against the tympanic bone and deafness or auriculo-temporal neuralgia cannot be caused by malocclusion.

Facial Nerve—Bell's Palsy

Kettel (37) considers Bell's Palsy as a pathogenetic entity due to ischemia of the facial nerve. Spontaneous recovery occurs in 85 percent by the occurrence of collateral circulation. Decompression should not be carried out until 2 months have passed without recovery. Decompression is done by opening the fallopian canal from the stylo-mastoid foramen to the horizontal semicircular canal.

Hearing Aids and Rehabilitation

Following the lead of the Army and Navy, many civilian institutions have developed training programs for the deaf, in which the use of a hearing aid is combined with lip reading. The use of hearing aids has increased greatly since the war, owing to technical improvements in the instruments.

Labyrinth

Glorig and Fowler (38) studied in detail the auditory and vestibular system in 32 cases receiving streptomycin. All were receiving large doses, 1.8 to 2.0 gm. daily.

All but one patient who had more than 2 months' therapy with streptomycin maintained a normal audiogram. Almost all had vestibular symptoms and signs. A fine hystagmus with lateral gaze in either direction could usually be seen a few days prior to the patient's noting vertigo. One of the first symptoms noted by the patient was a blurring of vision. This was believed to be due to a loss of tone of the ocular muscles.

Vertigo was different from that ordinarily experienced in that patients felt they were continuing to roll after rolling over in bed and frequently over-reached.

Vestibular tests showed that all but 3 of 23 patients who received streptomycin for more than 25 days had loss of reaction to rotation and caloric stimulation.

Healing of Experimental Labyrinthine Fistulas

Lindsay (39) points out that after experimental work on monkeys the tympanomeatal pedicle used in the Lempert operation was the most successful covering tried.

Hearing Loss in Otosclerosis

Ersner and Saltzman (40) point out that hearing loss for words in otosclerosis is greater than indicated by the pure tone loss as measured

by the audiogram and that word tests should be made on all cases prior to surgery. They have devised tests for this purpose to be used as an adjunct to pure tone testing by means of the audiometer.

Fenestration

Lempert (41) presented a new method of making the fenestra nov-ovalis and preventing bone dust and spicules from entering the perilymphatic space. In essence, he creates a thin cupola at the anterior aspect of the external semicircular canal and incises around the edges of the cupola. He lifts the lid off in one piece and then burnishes the edges of the fenestra with a lead bur.

Nose and Sinuses

Fomon, Gilbert, Silver, and Syracuse (42) devised a plastic repair of the obstructing anteriorly deviated and dislocated nasal septum by complete removal and placing a cartilage splint in the columella.

Mouth, Pharynx, and Nasopharynx

Tonsillectomy and Poliomyelitis.—Arnning (43), from the results of a statistical analysis, feels that the relationship between bulbar poliomyelitis and tonsillectomy is coincidental and that the removal of tonsils should not be postponed indefinitely simply because poliomyelitis is prevalent in the summer months.

PATHOLOGY

Mechanism of invasiveness of cancer cells (19).—By measuring the bend produced in a calibrated microneedle when used by micro-manipulation to separate squamous tissue cells, it was found that attached pairs of cancer cells can be separated with much less force than is required for the separation of benign tumor cells or normal cells. This decreased adhesiveness of malignant cells facilitates invasiveness and metastases. The detached cells by their capacity for amoeboid movement wander into adjacent tissue. This penetration of tissue is facilitated, at least in some cases, by the liberation of the spreading factor, hyaluronidase, which by hydrolyzing the hyaluronic acid of the intercellular cement substance of the connective tissue, opens tissue spaces. It is believed that the abnormally low calcium content found in cancerous tissue may explain the decreased adhesiveness of cancer cells.

Experimental atherosclerosis (20).—Rabbits, guinea pigs, and chickens develop hypercholesteremia and atherosclerosis when fed large amounts of cholesterol. Attempts to produce atherosclerosis in dogs, cats, and monkeys by cholesterol feeding has failed. If the function of the thyroid gland is modified by the administration of

thiouracil, then cholesterol feeding produces hypercholesteremia and atherosclerosis. The lesions in the arteries are strikingly similar in pathologic appearance and distribution to human atherosclerosis and arteriosclerosis. A control dog that received only thiouracil did not develop atherosclerosis. Progress in the study of atherosclerosis should be greatly aided by the ability to reproduce the disease in experimental, omnivorous mammals.

Rabbits fed cholesterol usually develop hypercholesteremia and atherosclerosis of the aorta, but when fed cholesterol to which choline is added they developed hypercholesteremia, but showed no macroscopic atherosclerosis.

Sludged blood (21).—Microscopic study, under suitable illumination, of the circulation through the bulbar conjunctival vessels of many normal and diseased animals and human beings revealed completely unagglutinated blood in healthy subjects and agglutination of red cells into masses, in a wide variety of pathologic conditions. This changed the blood from its normal homogenous fluid state to a circulating sludge, which damaged the body through the activity of at least four different factors: (a) The resistance of sludged blood to its own passage through the bottleneck in the circulatory system forcibly reduces the rate of blood flow through all the open vessels of the body; (b) agglutinated red cells are ingested and destroyed by the phagocytic cells of the liver and spleen; (c) there is settling and sedimentation of masses of agglutinated blood cells out of the moving plasma during life; (d) various degrees of reduction of circulating blood volume caused by the first two factors initiate intermittent prolonged controlled shutting off of the arterioles of a selected series of tissues and organs.

Exfoliative Cytology

An increasing interest has been shown in exfoliative cytology as a method for early diagnosis of cancer (18).

Tumor cells are present in any specific body fluid and it is presumed that such cells have originated from a tumor area, contributing to or in contact with the fluid examined. Criteria have been established whereby the differentiation of these tumor cells from the normal cells exfoliated in the body fluids, can be made, in many instances.

Skill in interpretation is difficult to acquire and several months of training and experience are considered necessary even for well-trained pathologists. The vaginal smear is of real value especially in the diagnosis of cancer of the cervix and many unsuspected carcinomas have been found in asymptomatic women. A negative smear does not exclude the possibility of cancer, and false positives are occasionally reported. Authors vary in their reports but in 1 series of

2,749 cases studies by vaginal smear including 339 cases of cancer of the cervix, 3.5 percent of the cancer cases were called negative and the error of false positive was 2 percent, thus giving a degree of accurate diagnosis of 94.5 percent (44). The percentage of false positives and negatives is generally somewhat higher than this.

The detection of carcinoma cells from the endometrium is more difficult since there is often not much difference between the appearance of malignant and normal endometrial cells. The error of false-negative reports therefore is much higher in smears from endometrial secretions.

In bronchial carcinoma, reports indicate that positive diagnoses are obtained from examination of bronchoscopic secretions in from 74 to 89 percent, the percentage varying with the authors. Some false-positive diagnoses are made. In one series of 200 positive smears only 4 or 2 percent proved to be false-positives (45). The same authors obtained 10 percent negative smears in cases of bronchial carcinoma. In a large number of cases, positive smears were obtained long before a definite diagnosis of the disease could be made either by the roentgenogram or bronchoscopic examination.

In the study of prostatic secretions for evidence of cancer, positive diagnosis has been made in from 75 to 85 percent.

Examination of the urine for malignant cells has not proved too successful. Reports indicate that cancer of the kidney has been diagnosed by urine examination in only 50 percent in one series and cancer of the bladder in 71 percent in another series, while false-positives have been reported as high as 10 percent (45).

In gastric cancer the examination of the stomach washings for cancer cells has not proved too satisfactory. Positive smears are obtained in from 48 to about 54 percent. The better technique consists of washing the empty stomach with saline solution, adding formalin, filtering, and making paraffin sections.

New Concept of Renal Circulation

A vascular mechanism in the kidney has been demonstrated by Trueta and his associates (51), through ingenious experiments, mainly on rabbits, cats, and dogs. By this mechanism blood flow can be shunted from the cortical tissue into the medullary vascular bed. Under conditions such as shocking injury to an extremity, or potent toxins circulating in the blood, a reflex vascular spasm of the interlobular arteries of the kidney is initiated through the splanchnic nerves. This vascular spasm occurs at a point slightly above their perpendicular branching into the cortex from the arcuate arteries and results in almost total ischemia of the cortex. The circulation of all the glomeruli can be shut off except for those few located at

the cortico-medullary junction whose afferent arterioles arise from the arteries proximal to the point of spasm. These glomeruli are larger than the others, and their large efferent arterioles shortly after leaving the glomerulus form numerous branches, the vasa rectae, which run vertically down into the renal pyramids. There they supply, by extensive anastomoses the renal tubules in the medulla. These vessels are capable of enormous distention and can handle the entire renal blood flow. This constitutes the shunt.

This mechanism appears to explain the anuria so often associated with the "crush syndrome" and other forms of lower nephron nephrosis, and the bilateral cortical necrosis sometimes seen following shock.

Hyaluronidase

Testicular and bacterial hyaluronidase, an enzyme capable of breaking down hyaluronic acid (a mucopolysaccharide acid which is important as an intercellular binding substance of normal tissue) has been studied for some years as a "spreading factor" in bacterial infections (46). More recent investigations have been concerned with the improvement of technical methods for determinations of hyaluronidase and the study of anti-hyaluronidase substances produced in blood serum and tissues.

Oncologists have found hyaluronidase to be an agent in tumor invasiveness. While it has been proved conclusively that many cancers produce this enzyme, the exact importance of it as an "invasive factor" is still unsettled (47). Other qualities of malignant cells, such as decreased mutual adhesiveness and ameboid movement, await evaluation (48).

Vaginal instillation of hyaluronidase to enhance fertilization is still in an experimental stage.

Total Body Irradiation From Atomic Bomb Explosion

Irradiation of the total body by atomic bomb explosions, as observed on the populations of bombed cities in Japan and confirmed by experimental work on animals, may produce all degrees of injury to tissue, depending on the dose of ionizing radiations delivered and the specific sensitivity of the several tissues. The lethal dose range for man is estimated to be from 300r to 600r. The most sensitive tissues are the lymphoid cells and organs, the immature blood cells in bone marrow, the germinal epithelium and the intestinal mucosa. Alteration of the capillary endothelium produces increased permeability with hemorrhages scattered throughout the body. Shallow agranulocytic ulcerations in the oropharynx and gastro-intestinal tracts occur not infrequently. Even though the patient may be able to survive the early effects of atomic bomb irradiation, the loss of the cellular de-

fenses of the body makes him vulnerable to death from secondary infections in the 6- to 8-week period before regeneration of the bone marrow and lymph nodes is firmly established.

PEDIATRICS

One of the advances in pediatrics is the acceptance of the Child Guidance Group's influence. This has swayed pediatricians from the rigid feeding schedules and the fixed quantities in feeding. It is now accepted practice to feed infants on demand with minimal limitations as to quantity and time. Simplification of formulas has accompanied this change.

Another improvement in infant care is the increasing awareness of the value of the "rooming-in" technic, in which the newborn infant is kept in the mother's room and cared for by her. Where this technic is employed epidemics have been eliminated and the number of infants infected reduced to almost nil.

For the older infant there is recognition of the importance of preventing behavior problems through a rational psychological approach to the child who, until very recently, was dealt with purely arbitrarily.

Evidence has been presented and is now accepted that an attack of Rubella in the mother during her first trimester of pregnancy is the etiologic factor responsible for congenital anomalies in the infant such as mental retardation, microcephalus, cardiac lesions, ocular defects, and deafness. It is believed that the virus passes the placental barrier and produces its effects directly on the developing fetus (50). It is believed that the virus gains entry into the cell, producing qualitative changes in the plasma proteins and metabolic disturbances which interfere with fetal development (49).

The fact that congenital dislocations of the hip can be detected in infancy, and deformity usually prevented, is becoming widespread knowledge.

Probably the most striking advances have taken place in the virus field. Definite specific diagnoses of the previously obscure encephalomyelitides are now made routinely. Lymphocytic choriomeningitis can be detected accurately. Virus pneumonia is no longer a waste-basket diagnosis. Skin tests have been developed for susceptibility to mumps and to whooping cough. The latter, of course, is not viral. The therapy for these diseases has been improved enormously. The hyperimmune human serum for pertussis has reduced the mortality in infants from approximately 40 percent to nearly zero. A similar serum for mumps, employed largely for orchitic involvement, has been used much less extensively to date, but has the same promise.

The discovery of the prevalence of histoplasmosis, the development of a skin test for it, and the general dissemination of knowledge

concerning histoplasmosis and its resemblance to tuberculosis was a real contribution. Toxoplasmosis, is now recognizable by immunologic methods also.

Work on vaccine for the virus influenza has proceeded well, as has the work on therapy for bacillus influenza meningitis. This previously fatal disease can now be treated successfully.

Treatment for diarrhea of the new-born and, for that matter, diarrheas in general, received new strength when it was found that potassium was lost in the course of the disease and that its replacement was of clinical importance.

Another observation of note along these lines was the importance of the adrenals in diarrhea. The depletion of the affected infant is often due, in part, to an adrenal insufficiency which can be remedied by the administration of desoxycorticosterone acetate.

Exploration of the Rh problem has been extended widely. Diagnosis and prognosis can now be tempered and need no longer be in the "all or none" category.

Inhalation of drugs for systemic use originated in pediatrics and recently has come into widespread use for a variety of conditions.

PHYSIOLOGY

The renal shunt (the work of Trueta and coworkers (51)) was a discovery of major significance.

The papers of H. W. Magoun and his associates on the reticular formation are probably the most illuminating since Sherrington originally described decerebrate rigidity in 1898. Magoun found that the more rostral part of the reticular formation is a facilitatory area, activating the stretch reflexes of the spinal cord. More caudally is an inhibitory area upon which impulses from the suppressor bands of the cerebral cortex, striatum, and anterior cerebellum impinge. In poliomyelitis the primary lesion in the preparalytic stage is concentrated in the inhibitory area of the reticular formation, giving the vacillatory area unrestrained operation, hence the great increase in stretch reflexes and spasms characteristic of the preparalytic stage of poliomyelitis.

PSYCHIATRY

The outstanding achievements in psychiatry during the years of 1947 and 1948 are difficult to estimate. It was not any single accomplishment, such as might have been found in medicine and surgery, but it was the more intelligent and more intensive focusing on the development of psychotherapy and the understanding that in an extremely large proportion of so-called medical and surgical

illnesses of all kinds, the important factor is functional and not strictly along the lines of organic pathology. This naturally means that more careful and thorough work was done and will continue to be done in the treatment of the whole individual who is sick.

RADIOLOGY

There were no really outstanding events in this field in 1947 and 1948, although the further development of cardiac angiography and catheterization of cardiac chambers deserves some emphasis.

The recognition of chronic berylliosis in the field of pulmonary pathology has been reasonably well advanced during this period.

Advances in the field of radiology include basic studies on radiobiology, including genetics, with relation to the use of radioactive isotopes, and atomic defense; improved technics for vascular radiography; improvement in photofluorography and extension of its use, including work on Schmidt lens; and improvement in super-voltage apparatus and availability of Van de Graaf generators and betatrons.

SURGERY

Contributions in surgery were many and consisted in the main, of further advances in fields already well established.

Further developments in the diagnosis and treatment of congenital intrathoracic vascular anomalies were made.

The importance of maintaining the protein, electrolytic, and fluid balance in pre- and post-operative care attained more widespread recognition.

Retropubic surgery for lesions of the prostate has been a worthwhile contribution. Improvements have been made in the technic of ureterosigmoidostomy.

The additional information obtained regarding gastro-intestinal physiology as the result of interest stimulated by renewed application of vagus nerve resection, was of benefit in evaluating results of gastric surgery.

With increasing experience and continued evaluation it appears that vagotomy is of definite value only in post-anastamotic marginal ulcers.

The "post-vagotomy syndrome" (diarrhea, intestinal cramps, weakness, failure to gain weight, varying long periods of gastric atony) is an unpredictable complication, and because of its incidence, cases for vagotomy should be carefully selected.

The rapid healing of long-standing varicose ulcers through the use of lumbar sympathectomy is impressive. This measure is also

of benefit in selected cases of trench foot, and for the relief of the trophic and sensory disturbances following immersion foot, frostbite, and similar conditions.

Surgical measures for the treatment of ascites, massive hematemesis from esophageal varices, and associated conditions, have resolved themselves principally into two procedures: portocaval anastomosis and lienorenal shunts. In the first instance, the portal vein is anastomosed to the inferior vena cava to sidetrack the portal circulation. In the second instance, splenectomy is performed with preservation of the splenic vein, and this is anastomosed to the left renal vein.

Reports on the use of the plastic peritoneal button in ascites, in which the peritoneal transudate is diverted into the subcutaneous layer of the anterior abdominal wall, are not encouraging. This minor operation is comparable, in its effects, to the transplantation of the omentum into the subcutaneous fat, an early operation for ascites which has practically been discarded. In cases in which previous splenectomy had been done the inferior or the superior mesenteric vein has been used instead of the splenic vein. These are formidable operations, of great technical difficulty, and carry a high mortality in inexperienced hands.

Carcinoma of the esophagus and of the cardiac end of the stomach are now considered problems for the general surgeon.

Molded polyethylene tubes have been described for use in bile duct anastomosis, and for the anastomosis of the colon and rectum. It has been used also to "wrap" large aneurysms, such as those of the abdominal aorta. Continuous intravenous infusions may be given with the tubing indwelling in the vein for long periods. No needle is necessary, and movement will not dislodge the tubing. Polyethylene is chemically inert, and produces neither inflammatory nor foreign body tissue reaction.

The use of curare as a supplement in anesthesia is now of established value.

ACHIEVEMENTS IN DENTISTRY

Operative Dentistry.—Histologic studies of pulps under silicate cements indicate that commercial cavity varnishes offer little or no protection to the pulp from the injurious effects of silica cement.

Prosthetic Dentistry.—Plastic forms are growing in favor in the preforming of partial dentures. They offer the nonspecialist a means of producing frameworks which are superior, mechanically and esthetically, to free-hand waxups. The improvement in the tapering of clasps and clasp arms contributes greatly to the strength of castings.

More extensive use of vacuum investing is saving a great deal of gold which formerly was wasted in the form of bubbles and flash; the process is also a great time-saver in the finishing of gold castings.

Crown and Bridge Dentistry.—Alginate base hydrocolloids are being used successfully in the indirect method of constructing crowns, bridges, and inlays. In most cases this requires much less time than the accepted method of using hydrocolloids in water baths.

Oral Surgery.—Absorbable oxidized cellulose, in cotton or gauze form, is being used more widely for controlling secondary hemorrhage following extraction of teeth.

Anticoagulants, such as heparin and dicumarol, are being used with some success in aborting thrombophlebitis, the precursor of complications such as Ludwig's angina and cavernous sinus thrombosis.

There is a definite trend away from the routine use of sulfonamides in massive doses in the post-extraction tooth sockets; light insufflation is the method of choice.

Biochemical Research and Dental Caries Control.—Radioactive phosphorous, P_{32} , is being used experimentally in prepared cavities at the time restorations are placed. The teeth are radiographed later, to determine how effectively the tubules have been sealed off, and also as a measure of sepsis. P_{32} is also being applied to the study of tooth metabolism and odontogenesis.

Chemical composition of the tooth surface is being more precisely determined and defined. There is growing evidence that the enamel cuticle or Nasmyth's membrane is not lost from the erupted tooth (except from abrading surfaces), and that the action of this cuticle or membrane may be one of selective dialyzation. These findings are important because caries starts on the enamel or tooth surface; these findings are of additional interest because of the present high favor of topical application of the fluorides.

The use of topical application of fluorides and other salts is under more intensive and extensive study. New communities are cooperating in such large-scale research projects. Several scientific organizations have cautioned against public acceptance of excessive claims suggested by the lay press. They have also pointed out that while continued evaluation has confirmed some benefits to certain segments of the population, these benefits are not necessarily applicable to the individual since some receive no measurable benefit from fluoride treatment. Overemphasis on the use of fluorides diverts attention from the importance of study of other salts and chemicals and from other techniques, and creates an impression with the general public that operative dental treatment, dental cleanliness, or the factors of sugar and other dietary factors, no longer need be considered important.

RESEARCH ACHIEVEMENTS OF THE DENTAL SECTION, NAVAL MEDICAL RESEARCH INSTITUTE

Uniformly dental caries-susceptible white and cotton rats have been bred and reared under vermin-free temperature and dietary controlled conditions. It is believed that these colonies are the only ones of their kind. They permit the study of factors influencing dental caries, under carefully controlled conditions. Similar colonies of hamsters are also being bred (65) (66) (NR).

Work on the role of the oxalates in dental caries of the white and the cotton rat has been negative, although this chemical is very effective in the prevention of enamel-etching by acid beverages in other laboratory animals. This work tends to support the theory that the acid factor in dental caries involving the tooth surface mechanism prior to enamel involvement may be less important than other factors (67) (NR).

A method to study salivary amylase activity was developed. No significant difference was found between the salivary amylase activity of persons with healthy teeth or those showing dental caries. Salivary amylase varies little from day to day (68) (NR).

In vitro studies conducted by the dental section, Naval Medical Research Unit No. 3, Cairo, Egypt, revealed that the saliva of patients with cholera did not produce lysis of the cholera vibrio, while the saliva of healthy individuals did. This extremely important observation warrants further research on the bacterial screening effect of oral tissues and fluids in air- and food-borne diseases (69) (NR).

Limited studies on dental caries in bacteria-free animals revealed that dental caries cannot be induced without the presence of bacteria in animals fed caries-producing diets (NR).

Studies now in progress indicate that tooth extraction and routine scaling of teeth produce few bacteremias. This finding is in contrast to that of several investigators who previously reported the incidence of bacteremias following oral surgical procedures to be high. Factors are being investigated (NR).

Electronic devices to study masticatory efficiency have been developed. By these means it has been possible to show that the average chewing efficiency of persons with complete natural dentition was approximately $2\frac{1}{2}$ times that of denture wearers. It is expected that application of such measuring devices will aid materially in dental prosthesis and permit a more accurate evaluation of whether or not patients should have partial dentures constructed (NR).

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- NR. Naval Research Project.

Recent Advances in Preventive Medicine

1947-1948

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Significant advances have been made in both the technical and the organizational aspects of preventive medicine. The outstanding achievement of the latter is the establishment of the permanent World Health Organization, successfully begun in 1948 with 54 member nations. This replaces the Interim Health Commission of the United Nations and continues the epidemiological work of the old League of Nations Health Organization, the Office Internationale d'Hygiene Publique, and the Health Division of United Nations and Rehabilitation Administration. Additional projects agreed to are fellowships, demonstrations, and exchange of information in several major fields of interest. Priority was given to malaria control, venereal disease control, tuberculosis control, environmental hygiene (sanitary engineering), maternal and child health, and nutrition. The example of cooperation set by the nations in world-wide preventive medical efforts is a bright spot. It is contemplated that the Pan American Sanitary Organization will become the World Health Organization regional organization for the Americas. With its long record of success in handling inter-American health problems, the trail it blazed should help the other regional organizations to take their first steps in greater confidence (1) (2).

A new step in the prevention of water pollution in the United States was the signing of the Water Pollution Control Act (Public Law 845, 80th Congress, 2d sess.) by President Truman on 30 June 1948, a milestone along the road to the recovery of our great natural resource—water. The act is primarily intended to promote research

and provide technical guidance and financial aid in planning and constructing waste treatment works of both surface and ground waters.

GENERAL SANITATION

The rise in importance of the cationic detergents in general sanitation of food establishments continues. Most members of this large and increasing family of "quaternary ammonium" compounds, such as various alkyl dimethyl benzyl ammonium chlorides and allied compounds, have high germicidal value. One serious drawback has been the difficulty of measuring concentrations which remain after periods of use. A quick and simple test was greatly needed.

Charles G. Marshall and Raymond V. Stone, D. V. M., Director, Bureau of Laboratories, Los Angeles County Health Department, California, have developed a test paper that gives a practical color range of 0, 100, 200, and 300 parts per million. The color chart ranges from the somewhat light lilaclike brown color for zero, to a light gray for 100 p. p. m., a light greenish-gray for 200, and a light bluish-green for 300. It is called "Stone-Marshall Test Paper 'A' for Quaternary Ammonium Compounds."

It is impractical to endeavor to prepare a color chart to read in steps of 50 p. p. m. Accordingly, one must practice with the paper in order to become familiar with its technical utility. The color chart "A" is most adaptable to Roccal, B T C, Rodalon, and NOPCOQCL. Of course, all products that are made up from alkyl dimethyl benzyl ammonium chloride will respond to this chart "A." Complaints from those who expected an easy "red, white, or blue" color differentiation can only be answered by a request that one practice with known solutions. The color appearing between 0 and 100, 100 and 200, 200 and 300 can be observed and familiarized.

Charts for compounds other than those for which chart "A" is adapted may ultimately be produced. In the meantime, they "yield" to the 200 p. p. m. zone color of chart "A"; may or may not compare as well in the 100 p. p. m. zone. Test paper strips and one gray-greenish color bar are available for those manufacturers who desire an inexpensive "unit" for accommodating a few tests (3).

Mechanical Dishwashing

A Study of Mechanical Dishwashing, by W. L. Mallmann, Ph. D., of the University of Michigan, and associates, confirms that the standards of time and temperature that have been in use are satisfactory.

(a) *Single tank-door type—Time controlled.*—The washing period shall be not less than 40 seconds with the temperature of the water

held at 140° F. This is to be followed by rinsing for 10 seconds with the water at a temperature of not less than 180° F., and a minimum of 1½ gallons of water per 20-inch tray.

(b) *Double tank—Fixed time conveyor.*—The washing period shall be not less than 20 seconds, with the temperature of the water held at 140° F. This is to be followed by rinsing for 10 seconds with the water at a temperature of not less than 180° F. exclusive of curtain rinse.

The disinfectant efficiency of both chlorine and chloramine are highly sensitive to pH changes. The efficiency of chlorine at pH 9.5 is about one-twenty-fifth of what it is at pH 7.0, and for chloramine, the ratio is about one to ten. While both are much more efficient at pH around 7.0, it is seldom practical to put water of such low pH in iron pipes. At working pH's the following table was suggested recently by National Research Council.

TABLE 1

pH	Free available chlorine— minimum contact 10 minutes	Combined available chlorine— minimum contact 60 minutes
	<i>P. p. m.</i>	<i>P. p. m.</i>
Below 8.....	0.2	1.5
8 to 9.....	.4	2.0
Above 9.....	.8	

It should be noted that the addition of calcium hypochlorite ordinarily raises the pH of the water, while free chlorine (gas) depresses it (4).

COMMUNICABLE DISEASE CONTROL

Control of respiratory diseases and influenza specifically has been the object of considerable research.

The influenza epidemics of 1943 and 1945 provided opportunity for the evaluation of combined influenza A and B virus vaccine as a means of protection against this disease. The studies presented highly significant results in favor of the prophylactic value of vaccination even when the vaccine was given as long as a year prior to the outbreak.

Studies by Loosli et al (5) and Frances and others, during the influenza epidemic of 1947 failed to demonstrate protection following vaccination. Whereas in the 1943 and 1945 epidemics it was established that the epidemic was caused by virus strain closely related to the strains of virus present in the vaccine; in the 1947 epidemic, although the virus was demonstrated to be an influenza A virus, no close antigenic relationship was found to exist between the influenza

viruses and the influenza A component of the vaccine. Since this experience, routine vaccination with currently available vaccines has been generally abandoned.

There is a general belief that the influenza virus is particularly labile, capable of producing mutant strains of varying virulence and antigenicity. To this end research activity has been devoted to an analysis of antigenic patterns of influenza viruses and to attempts to discover a single strain with a broad antigenic pattern that would stimulate immunity against a wide variety of strains.

In epidemiological studies, the periodicity of influenza epidemics due to known types has been observed and the theory postulated that epidemics of influenza A recur in cycles of 2 to 3 years and epidemics of influenza B from 4 to 6 years.

It has been recognized that the understanding of the epidemiology of influenza, the occurrence of mutants and their local or universal spread is not precise. The prevalence of influenza due to viruses A and B in different countries is not clearly recorded. The causal relationship of the rise and fall of epidemics, due to endemic or imported strains of influenza has not been established. Strains occurring in one country from year to year have not been adequately compared nor have strains occurring in different countries in the same year.

In order that precise epidemiological information, as to the appearance, type, and spread of epidemics, and the comparison of serological races of influenza may be accomplished, international action under the auspices of the World Health Organization has been inaugurated in the establishment of regional influenza information centers throughout the world. These watch stations will be on the lookout for incipient epidemics of influenza, will attempt to define the antigenic character of the causal agent, and if a new virus is isolated early, it is hoped that a vaccine may be prepared for the protection of population groups before the epidemic reaches them.

With widespread rapid transportation throughout the world such a hope seems slender indeed when it is realized 4 to 7 months are required to produce by the best commercial methods a sufficiently large amount of vaccine to immunize major population groups. The possibility exists that a vaccine may be prepared against a virus which appears in the spring and which is not disseminated in the summer but becomes active in the fall.

While most of the new developments in antibiotics are primarily concerned with treatment, they have been turned toward prevention also. Chloromycetin, a new antibiotic, related to streptomycin, has been reported very effective in the treatment of epidemic and murine typhus, Rocky Mountain spotted fever, (6) scrub typhus (7), and typhoid fever (8). It is quite effective by mouth. An Army group

recently tested chloromycetin in small doses orally (unpublished), for suppressive treatment of persons exposed in highly endemic scrub typhus areas. The measure proved entirely effective during the time the drug was being administered, but a high percentage became ill when the drug was discontinued within 2 weeks after leaving the area of exposure. A longer time on suppressive doses apparently resulted in true cures. Chloromycetin is still in the experimental stage and only very small amounts are available. It has been synthesized and may soon become plentiful.

The only change in standard immunizations was the reduction of the second and third doses of typhoid-paratyphoid vaccine to 0.5 ml. It was shown by Luippold et al. (9) that the mouse-protection titres of serum following this smaller dosage were as high or higher than after the 1.0 ml. dose.

The warning was repeated that vaccines containing egg material (typhus, influenza, Rocky Mountain spotted fever, and in smaller amounts, yellow fever) should not be given to persons who cannot eat eggs. A few fatalities have occurred from administration of these vaccines to persons highly sensitive to eggs (10) (11) (12).

Tuberculosis Control

The most potent weapon developed thus far in tuberculosis control is the photofluorogram. The use of this instrument was given impetus by World War II when the miniature roentgenogram was used to examine all persons at time of entry into and upon separation from military service. Roentgenograms of approximately 23 million people were made at the joint Army-Navy induction centers during World War II. Approximately 14 million of those accepted have now been demobilized and with rare exceptions roentgenograms were made before discharge. Although the primary purpose of the induction survey was to exclude from military service those with pulmonary tuberculosis, many thousands of cases still in the minimal stages of the disease were detected and medical treatment arranged which prevented further spread of disease in the Navy and civilian communities, as well. This has contributed to a decline in naval tuberculosis rates. Dr. Esmond Long has stated that the present decline in death rates from tuberculosis may be due in large part to the results obtained from the mass roentgenogram surveys conducted by the armed forces.

The United States Public Health Service, cooperating with local health agencies has conducted a chest roentgenogram survey in two large cities of the United States during the past year (Minneapolis, Minn., and Washington, D. C.). In each survey, it was demonstrated that 1.27 percent of the adult population surveyed presented lesions in

the roentgenograms which were suggestive of tuberculosis. The miniature roentgenograms also disclosed that 1 percent of the population had other chest lesions such as cardiovascular disease, lung tumors, etc., most of which were in an early stage (when treatment is most likely to be successful). These surveys have demonstrated that it is feasible to make roentgenograms of large segments of the population and that the results justify the cost and effort. The next step is to make the surveys nation-wide.

It has been demonstrated that the photofluorogram, 35 mm. or larger, is as accurate for case finding purposes as the conventional 14- by 17-inch roentgenogram (13).

Since surveys have shown that approximately 97 percent of the population have essentially normal thoracic structures, this large segment of the population can be screened out by the rapid and relatively inexpensive photofluorographic technique. The attention of the epidemiologist and clinician can then be focused on the 3 percent of the population whose photofluorograms demonstrate suspicious lesions. These can be studied in detail by serial conventional roentgenograms, and clinical and laboratory methods.

Many pulmonary calcifications and minimal infiltrates are being discovered, the significance of which it is difficult or impossible to determine by its appearance in the single chest roentgenogram. Although the roentgenologist does not make the diagnosis from a single roentgenogram, he must decide which lesions require further clinical study and which do not. The recent studies which give the prevalence and more accurately describe certain nontuberculous pulmonary lesions have been of great assistance.

Furcolow et al, (14) have expanded previous studies showing that in the upper Mississippi Basin it is not uncommon to see small discrete pulmonary infiltrates or calcifications in patients who have negative tuberculin and positive histoplasmin skin tests. Jamison (15) reported another fungus infection of the lung, coccidioidomycosis, which is more common in the Southwest and strongly resembles tuberculosis in that it gives rise to thin-walled cavities and exudative infiltrates. Sarcoidosis, a disease of unknown etiology, has been recognized much more frequently in recent years (16). The most common pulmonary forms of the disease appear in the roentgenogram as disseminated miliary nodules, or reticulated strandlike areas extending from the hilus. It is important to differentiate those nontuberculous lesions from the similar but more ominous lesions caused by the tubercle bacillus.

Although vaccination against tuberculosis is not new (the first human application of the bacillus of Calmette and Guérin (BCG) vaccine was made in 1921) the past year has seen a renewed interest

in this preventive measure. This renewed interest has been due in large part to the studies of the North American Indians reported by Drs. Aronson and Palmer in 1946. Over a 6-year period the mortality from tuberculosis in a control group of 1,500 subjects was 7 times as great as in a comparable group in which the bacillus of Calmette and Guérin (BCG) vaccine was used. In January 1948 Rosenthal described a multiple puncture method of vaccination with which practically all bothersome local complications to vaccination were avoided (17).

Under the auspices of the United States Public Health Service, a conference on BCG was held in Washington, D. C., on 7 September 1946. The conclusions of this representative body of proponents and opponents of BCG vaccination were:

1. Medical literature fails to reveal any proved cases of progressive disease as a result of BCG vaccination.
2. From studies presented it appears that BCG vaccination confers increased resistance to tuberculosis for the limited period of time covered in these studies.
3. Extensive investigations should be carried on cooperatively with recognized research groups throughout the country during the coming years, especially in population groups highly exposed to tuberculous infection (18).

At the First International Congress on BCG held in Paris and Lille, France, 18-23 June 1948 the following resolutions were adopted:

1. Study of more than 10,000,000 vaccinations, made throughout the entire world in the course of 25 years, has established the absolute safety of BCG vaccination in human beings.
2. Vaccination by way of the skin is recommended, various methods of application are available.
3. Although the vaccination of all new-born is primarily desirable, vaccination of older subjects, such as adolescents and young adults who have a negative tuberculin reaction, should take an important place in the categories of persons the most exposed; for example, students, medical personnel, recruits, etc.
4. The Congress recommends continuance of all other prophylactic measures in use in the campaign against tuberculosis.

One of the greatest deterrents to the use of BCG vaccine has been its short life of potency. The vaccine now in use is not recommended for administration more than 7 days after preparation. The vaccine must be prepared with utmost care to prevent contamination by virulent tubercle bacilli. Studies are in progress to determine the minimum effective dose of the attenuated bacilli and methods of preparation by which the vaccine potency may be lengthened.

VENEREAL DISEASE CONTROL

In venereal disease control, treatment still outstrips prevention and the latest absorption delaying forms of penicillin have already made ambulatory treatment of syphilis practical with 1 injection per day for 10 doses (and possibly a single dose). At present, procaine penicillin, a true salt of penicillin G, and relatively insoluble, appears most promising. In the form of an oily suspension with aluminum monostearate, low but effective blood levels are obtained in over 90 percent of persons tested for 4 days or more.

The epidemiologic investigation is the most precise weapon in control. Eliciting information on all the contacts of known cases, enables the infected to be found and rendered noninfectious at an earlier date than would obtain in the normal course of events. The military contact investigation in the past has left much to be desired. Two new developments are the Navy's Contact Interviewer's Manual, and a 2 weeks' demonstration and practice course given by the United States Public Health Service for contact interviewers. The Kinsey report has increased the estimate of the number of contacts which should be elicited from each case by a good interviewer.

Educational methods are being more carefully scrutinized and evaluation of various media is planned which will guide future efforts.

Studies were conducted in the Navy on the use of oral penicillin tablets for prophylaxis in gonorrhea and in syphilis. The first of these studies has been reported by Eagle et al. (19) and will be published in the Journal of the American Public Health Association. The method is based on experimental evidence that a very small dose of penicillin serves to cure (abort) an infection if given soon after the inoculation, and that the curative dose rises progressively with the multiplication of the organisms in the body. In the experiment reported, oral tablets of both 100 thousand and 250 thousand units were used, and highly significant reduction (about 80 percent) in incidence of gonorrhea was achieved. The second study indicates that a delay of 8 to 18 hours will seriously reduce the effectiveness. It should be noted that this is still in the experimental stage; that the optimal time-dosage-percent cure-relationships are far from fully worked out; that it affords no protection against chancroid and lymphogranuloma venereum, which are one-third as prevalent as syphilis; and that the protection it affords against syphilis is not known. It also should be noted that the cost is high, at present about 37 cents for a 250-thousand-unit tablet.

With regard to prevention of syphilis on the basis of prophylaxis: while the masking effect against syphilis from a single oral dose is presumably negligible, it seems not unlikely that a frequency of use

might well occur in some individuals which would suppress (mask) but not cure that disease. The question of developing penicillin-resistant strains of gonorrhea and syphilis cannot be answered as yet. The probability of such occurrence seems to be much lower, at least in the case of penicillin in gonorrhea. There is some evidence that penicillin resistance in gonococci disappears rather quickly.

A reversion to punitive measures in the form of 30-60-90-day restriction was tried in certain branches of the Armed Services beginning in early 1947 and was found to be effective in reducing reported cases. The reduction was found to involve gonorrhea but not syphilis, and has generally been conceded to be a reduction in reporting rather than control of venereal disease. The new regulations permitting undesirable discharges for repeated venereal infections, while getting rid of some repeaters who exert a bad influence on their fellows, also leads to some unofficial treatment, it is believed. All measures which drive servicemen to seek treatment outside the service should be very carefully weighed before adoption (20).

Research now in progress indicates that artificial culture media permits survival of virulent *treponema pallidum* in vitro for a period of half-life of 6 to 8 days. This offers the opportunity for progressive research in the field of antibiotics, immunity, and diagnostic methods.

One of the most important advances in venereal disease control has been in the field of education. To control venereal disease effectively, influence must be exerted on the attitudes and actions of individuals, therefore, education of the general public in the nature of these diseases, the modes of transmission, and the necessity for early and adequate diagnosis and treatment has received a large measure of attention in the program for the prevention and control of venereal disease.

The United States Public Health Service, in cooperation with Columbia University, has taken the lead in developing means and media for mass education and assistance of various cities and communities in these educational programs. Disk recordings for radio transcription with characterization by leading stars of stage and screen and the cooperation of radio broadcasting stations have brought venereal disease dramas into the home. These transcriptions have proved as interesting to homemakers as the serial dramas presented daily on the radio (29).

The use of radio, television, newspapers, and motion picture outlets plus the mass distribution of informative pamphlets and other written material to inform the public of the efficiency and accessibility of a single-injection, rapid treatment of gonorrhea with penicillin and to direct those who suspect exposure to possible infection to visit their private physician has proved effective in several cities such as Washington, D. C., Columbus, Ohio, and New York City. As a result of

these programs as much as a 70 percent increase in the total persons reporting for clinical examinations has been reported (27) (28) (29).

Since the venereal diseases are contracted by military personnel almost entirely from the civilian populace, it is felt that education of the civilians will materially aid the military forces in their drive to reduce the incidence of venereal disease. Within the military services during the last 18 months, education has been the theme, and emphasis has been placed on character building, responsibility, and personal conduct in the individual. It is believed education is one of the best means at hand for effectively reducing promiscuity, thus reducing venereal disease in civilians as well as in military personnel.

MALARIA AND INSECT CONTROL

Development of DDT resistant flies.—The Bureau of Entomology and Plant Quarantine, United States Department of Agriculture, has developed a special colony of DDT-resistant houseflies which has been reared through many generations (21). Laboratory tests indicate that most of the resistance is lost after the insects are reared normally for 12 to 14 generations. Information has been received that this colony has been given similar treatments up to the present time and as of this date the resistance of the special colony as compared with the regular laboratory strain approaches 100 times that of the latter.

From personal communication with a representative of the Bureau of Entomology and Plant Quarantine it was learned that flies collected in nature where DDT failed to provide control were tested in comparison with the regular laboratory strain which has never been exposed to DDT. It was found that certain strains of flies in nature require approximately 30 times the period of contact to given DDT dosages to produce mortalities comparable with those obtained using the laboratory strain. This has been demonstrated in flies collected in several States.

DDT residual treatments of the interior of houses for the control of adult mosquitoes and other insects have been under extensive study for the past few years. The use of DDT in this manner is considered to be a great step forward in malaria suppression. The use of residuals coupled with airplane dispersal, larviciding, and the use of fog generators has gone far toward eliminating the need for expensive permanent mosquito control measures formerly required in malarious areas.

Dispersal of DDT by aircraft.—Many factors are involved in the dispersal of DDT by aircraft, such as the speed of the plane, height of flight, wind direction and velocity, air currents, and foliage penetration. In general, fast planes must fly high, and high-flying planes must dispense coarse droplets in order to get the insecticide to the

ground without too much loss. These coarse droplets resemble rain falling under the plane which results in poor distribution, low adult kill, and is uneconomical. Such spraying requires dosage levels that are dangerous to fish and wildlife. Slow-flying planes, on the other hand, are utilized at a lower level, depositing the insecticide evenly in relatively small droplets with more effective results. Applications are usually made during early morning or late afternoon when there is less wind and convection currents.

The State entomologist of New York successfully utilized the helicopter for DDT fog dispersal during the past season in the control of adult blackflies. The down-draft produced by the rotor aided in forcing the fog through heavy foliage. The plane was flown at a speed of approximately 10 miles per hour, 10 feet above the tops of the trees.

Fog generators.—The Navy's Besler and Todd smoke generators have been converted for use as thermal insecticide fog applicators in adult insect control. Such fog applicators are of special value where unknown breeding areas, or those outside the control area, produce flights of adult mosquitoes which appear in inhabited areas. With insecticidal fogs the small particle size produced makes the proper combination of temperature, humidity, wind, and convection currents of extreme importance. Properly used, however, fog generators constitute an important advance in ground control methods.

New Insecticides and Acaracides.—In recent years a number of new compounds have been discovered which are in some respects of the same order of effectiveness as DDT against various insects such as flies, mosquitoes, fleas, and lice. New mite and tick killing agents have also been developed.

According to Knipling (22) the new insecticides and acaracides include the following: Various analogues of DDT such as TDE (DDD) and Methoxychlor, chlordane, benzene hexachloride, chlorinated camphene, parathion, and piperonyl butoxide. Some of these insecticides are now in use, others are still in the experimental stage since their toxicity to warm-blooded animals must be determined before some of the materials can be recommended for general use.

TDE (dichloro-diphenyl-dichloroethane) is one of the most promising analogues of DDT as it has shown high toxicity to the larvae of mosquitoes, blackflies, and other aquatic diptera. It has been found to be less effective than DDT for other purposes. Methoxychlor is not as toxic to warm-blooded animals as TDE, but is less effective as an insecticide.

Benzene hexachloride has proved to be a very effective insecticide and acaricide. It does not have the residual properties possessed by some of the other materials and has an objectionable odor.

Chlordane is highly effective in the control of certain insects, mites, and ticks. It has less persistent residual properties than DDT but is especially effective against cockroaches and ants.

Chlorinated camphene shows promise for use against ticks and mites. It is less effective than DDT in the control of flies and mosquitoes.

Parathion is extremely toxic to warm-blooded animals and its use in the field of preventive medicine will probably be limited. It is unusually toxic to practically all insects attacking man and animals.

With new and superior antimalarial drugs available, interest in community suppression or eradication of malaria by drug therapy alone has revived. Chloroquin and paludrine appear to be the agents of choice, the latter requiring about double its usually recommended dose to equal chloroquin for suppression. This still is well below the maximum safe dose. One tablet per person per week may be given to a community heavily infected with malaria, and the incidence of positive bloods reduced from 60 to 1 or 2 percent in a few weeks. This may prove to be the easiest and most economical approach to malaria control in many tropical countries (23).

Several new filaricidal drugs have been developed, the most promising of which are nonmetallic compounds effective by mouth. Of these, the best so far is hetrazan, which in a dose of 2 mg. per kilo three times daily for 7 to 30 days, will eliminate microfilaria, and is thought by some to kill adult filaria also (24) (25).

An extensive research project has been started by the Naval Medical Research Institute to test the feasibility of completely controlling or eliminating filariasis from Samoa.

RODENT CONTROL

During the postwar years of 1947 and 1948 progress in rodent control has been limited practically to continued research on rodenticides, repellents, and rodent barriers. Patterns have gradually appeared in control of typhus transmitted by rodent ectoparasites. Micronized wettable DDT has emerged as an experimental weapon against *mus musculus*, the house mouse. A comparatively new rodenticide, Castrix, has been studied, but results do not appear conclusive. Considerable research has been accomplished relative to coloring of sodium monofluoracetate and a chemical company has developed an acceptable mixture with nigrosine, a jet black dye, and it is probable that all sodium monofluoracetate may eventually have this color. Trials of prepared baits for service distribution have resulted in generally unfavorable reports. Research reports seem to indicate that much more work will be necessary before any effective barrier material is recommended.

Significant publications have appeared in fairly large numbers and include Army Technical Manual TM #5-632 of October 1947, a useful and rather comprehensive handbook covering insect and rodent control operations and materials. Public Health Reports of 11 June 1948, No. 24, volume 63 contains an article entitled "Rats and Typhus Fever in Texas." Two papers by Carl Mohr deal with small mammal populations. California Agricultural Extension Service Circular No. 138 is an attractive pamphlet entitled "Control of Field Rodents in California" by Tracy I. Storer. Other publications are listed in "Bibliography of Rodent Control (First Supplement) and Bibliography of Antu" by Tracy I. Storer and Margaret P. Mann. This report was published by the Federal Security Agency, Public Health Service in Washington in 1948 and includes a one-page discussion of the use, action, and toxicology of ANTU. The Fish and Wildlife Service is preparing a brochure on sodium monofluoroacetate (1080) similar in coverage to BuMed C/L #47-140 of 10 October 1947.

NUTRITION

R. L. Harris (26) of Massachusetts Institute of Technology, has shown that many plant foods used as diet by supposedly backward peoples in foreign countries contain more essential vitamins and minerals than any of our own. He cautions against disturbing the dietary pattern of any foreign group with our own ideas of what constitutes a good diet, without a complete analysis of its present value.

INDUSTRIAL HEALTH

In a statement by the Council on Industrial Health of the American Medical Association, Industrial Health is defined as an inclusive term incorporating three major types of activity.

1. Medical and surgical care to accomplish prompt restoration to health and earning capacity following industrial accidents or diseases.
2. Prevention of diseases or injury in industry by the establishment of proper controls of industrial environment.
3. Education of employees on healthful living in their use of industrial environment.

From this statement it is seen that industrial health is a practical endeavor which draws on all phases of science to accomplish these functions. Therefore, any advance in science which would find practical application in industrial health could be considered as an advance in this field. However, to be more specific, the advances in the ever-expanding field of industrial health may be divided into two categories: those which deal with administration and those which deal with what might be termed technical advances.

Administration.—The assumption of responsibility for health of employees by management on an ever-widening basis continues. The Chamber of Commerce of the United States and the National Association of Manufacturers are examples of groups which have been working actively to stimulate establishment of medical services in industry. This great expansion to extend industrial health services to include general medical care for their employees, and in some cases for the families of employees, has been one of the outstanding advances in recent years. Organized labor has also been actively engaged in expansion of health services in industry and is responsible for the inclusion of various health and welfare clauses in labor-management agreements. In considering the expansion of industrial health facilities the role of the Federal Government and State and local governments in extending services on a greatly expanded scale to industry should not be overlooked.

More and more members of the medical profession are being attracted to the field of industrial medicine either on a part-time or full-time basis for industry, insurance companies, labor unions, and so forth. Recently attempts have been made to recognize industrial medicine as a specialty and efforts are under way at present to establish an American Specialty Board in Industrial Medicine.

During the war when this country was scraping the bottom of the manpower barrel, means were devised to select men and place them according to their physical as well as professional and psychological aptitudes in order to get the utmost benefits from their talents. Now, with the greater expansion of industrial health and the need for the employment of hundreds of thousands of handicapped veterans, together with the realization that the working population is becoming older, attention has been focused more actively upon the value of proper job placement of individuals.

The general trend of many articles on industrial medicine in recent years has shown a marked tendency toward emphasis on the practice of psychosomatic medicine. A successful industrial physician should possess the attributes of a physician, lawyer, and minister. In addition to being able to give counsel to the patient to soothe the psyche he must treat him for a laceration or contusion, and at the same time be able to explain the legal aspects of occupational and nonoccupational diseases.

Technical.—The public health aspects of developments in the field of nuclear energy have recently gained importance. The potential health hazards incident to the industrial and scientific development of nuclear energy are many. Great emphasis has been placed in recent months on training many individuals in health physics and radiological safety in order that these persons may learn and apply methods

of prevention of injury to personnel from radiations, whether working in this field from the point of view of development of nuclear energy, or from using these newly created substances as tools in scientific research.

Recent work with an antilewisite compound known as BAL has shown its value and usefulness in arsenical as well as mercury poisoning, and its therapeutic use is becoming widespread.

The application of nutrition in the prevention and therapy of occupational diseases appears to be gaining considerably more interest. While little is known regarding this field, a greater tendency seems to be developing toward this avenue of investigation.

Any new information on allergy appears always to find application in industrial health especially in that largest of all groups of industrial diseases, the industrial dermatoses. The discovery and use of antihistaminics as pyribenzamine, benadryl, and others, has found wide application in the control and therapy of numerous conditions ordinarily falling into this category.

Continuous research is being done on air pollution from the point of view of attempting to reduce respiratory infections and disease through the use of physical (radiation), chemical (glycols), and physicochemical means. Since respiratory disease (perhaps mostly of a non-occupational origin) is responsible for approximately 90 percent of lost time from work, it is important to recognize economy which could accrue from the discovery of a practical means of reducing air pollution which we know is conducive to the spread of respiratory diseases in industry and outside of industry in places such as busses, restaurants, theatres, and elsewhere where large crowds of people congregate.

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EDITORIAL



Acute Renal Insufficiency

Outstanding has been the achievement of Trueta and his group, in their discovery of the renal shunt. This illuminating work has clarified the pathogenesis of acute renal insufficiency and has given promise for a more rational approach to treatment.

Acute renal insufficiency occurs in many conditions, among which are; "shock" following burns, freezing, vascular occlusion, intestinal strangulation, and visceral perforation; a number of toxic drugs (including carbon tetrachloride, neoarsphenamine, sulfadiazine, mercuric bichloride); transfusion reactions; crushing injuries; severe infections; dehydration; hemorrhage, and high altitudes (5) (13) (3).

The work of Lucke (5), Bywaters (2), and others (13) stresses the fact that the renal lesion in all these cases occurs (in a similar region of the kidney) in the distal convoluted tubule and that the glomeruli are not involved, and that the pathologic findings are not sufficient to explain the anuria on a basis of a noxious agent acting directly on kidney tissue.

Laycock (1), (cited by Trueta (4)) in a report, published in 1838, of two cases of anuria which occurred during the course of hysterical attacks, recognized the relationship between nervous disorders and disturbances of renal function.

Bywaters (2) discusses his experience (and cites those of Beal and his coworkers and of others) in the post-traumatic condition known as "crush syndrome" in which, as a result of continuous compression of a portion of the body or of one or more limbs, usually the legs, the symptoms of shock occur. Some temporary improvement in the general condition occurs after release and the use of supportive measures such as plasma and morphine, but progressive impairment of kidney function ensues, followed by death from renal failure about 1 week after injury. The pathologic findings in the kidney as reported by Bywaters are similar to those described by others (2) (5). The kidneys show foci of tubular necrosis most pronounced in the distal convoluted tubule and pigment casts are found in the distal convoluted tubule. The glomeruli are not involved.

Corcoran and Page (3) found that the initial effects of hypotension of shock is to reduce the renal blood volume; that if hypotension is prolonged beyond 40 minutes there ensues an increased resistance to the flow of blood through the arteries and oliguria or anuria persists even when the blood pressure is restored. They believe that this increased resistance to the flow of blood is due to vasoconstriction of the renal arteries which in turn produces renal ischemia and anoxia. As a result of their work they came to the following conclusions: "(1) Renal vasoconstriction of humoral origin apparently arising from damaged tissue occurs in shock, whether caused by bleeding or by skeletal injury. (2) When sufficiently prolonged such vasoconstriction and its consequent anuria may persist in spite of restoration of blood volume and blood pressure. (3) Renal ischemia and oliguria, which of themselves might be inadequate to cause renal failure, predispose to the intra-renal precipitation of myohemoglobin, which leads to renal failure of the type known as crush syndrome. (4) The treatment of crush syndrome is prophylactic and rests on the prevention of renal ischemia and of deposition of pigment."

Trueta, and his coworkers (4), by the use of radiologic techniques and angiograms, found that the application of a tourniquet to the left hind limb of animals produced a vasospasm of the femoral artery above and below the site of the tourniquet as well as a marked spasm of the femoral artery of the uninjured limb, the spasm beginning at the corresponding level and persisting for days after removal of the tourniquet. Further, that vasospasm of the left renal artery occurred simultaneously and its lumen reduced by about 25 percent, but in spite of this, the left renal circuit time was shortened by 50 percent. They reveal that blood has two potential routes through the kidney and according to circumstances may pass almost exclusively by one or the other routes or in varying proportions through each; that the vessels of the cortical glomeruli are a part of the greater circulation of the kidneys and those of the juxta-medullary glomeruli are a part of the lesser circulation of the kidneys. The routes converge where the afferent arteries of the juxta-medullary glomeruli leave the interlobular arteries. One route passes through the juxta-medullary glomeruli, the afferent vessels of these glomeruli, and their derivatives, the vasa-recta, to the interlobular veins. The other route, the cortical, passes through the interlobular arteries, afferent arteries of the remaining glomeruli and afferent vessels, and the cortical intertubular capillary network into which they break up, and finally through the veins draining this network into the interlobular veins.

They further observed that as a result of peripheral or central nervous tissue stimulation induced by various means, ranging from direct nerve stimulus to the parenteral administration of hormones

and toxins, an arterial spasm of the renal cortical vessels occurs and the blood supply, which in the normal animal is received in greater amount by the renal cortex, is partly or wholly diverted from the cortex of the kidney through the medullary blood channels, thus rendering the outer two-thirds of the kidney cortex anoxic and ischemic. If this vasospasm persists permanent damage of the renal cortex occurs; the medulla shows only a marked congestion. With staphylococcus toxin, renal and femoral artery spasm and mesenteric artery dilation occurs with resulting atony and ischemia of the intestines and necrosis of the cortex of the kidney; the medulla remains healthy and its circulation intact.

In contrast to the diversion of the blood supply from the cortex to the medulla, when the splanchnic nerves were severed and then a tourniquet applied to the limb, the blood flow was diverted from the medulla to the cortex. All other vessels except the mesenteric artery showed the typical vasospasm response, indicating that the vascular change in the kidneys depends upon the integrity of the splanchnic nerves and that after section of the sympathetic nerves, the renal shunt cannot be produced.

Trueta et al. show that the renal shunt mechanism can be activated by reflex means through the splanchnic innervation, and that the glomerular circulation is subject to direct regulation by central nervous system through its sympathetic division; that the mechanism of the renal shunt in shock is protective, preventing fluid loss by diverting blood from the kidney filters.

Trueta indicates that prolonged and persistent overactivity of the normal renal shunt mechanism may result in arterial hypertension. This is comparable to the constriction of the renal artery in the production of hypertension—the work of Goldblatt.

Pathologic Findings

Lucke (5) states that acute renal insufficiency was the most frequent form of fatal renal disorder noted during World War II and lists 538 cases all having similar characteristic renal lesions. Causes of death in these cases included battle wounds, mine and blast injuries, crushing injuries, abdominal operations, burns, blood transfusion reactions, sulfonamide intoxication, heat stroke, rickettsial disease, black-water fever, poisoning (arsenicals, carbon tetrachloride, carbon monoxide, alcohol, phenol, photo-developer, mussel, mushroom), uteroplacental damage, acute pancreatitis, "shock" from various causes.

The pathologic changes noted in the kidneys were all similar. The cortical zone was pale and widened while the medulla was dusky. Selective degeneration or necrosis of the distal convoluted tubules and the ascending loop of Henle was constant. Relatively slight or no

structural changes were noted in the upper part of the nephron; the glomeruli were normal (5).

These findings are similar to those reported by Bywaters and others (2).

Treatment

Muirhead and Hill (6) state that the mortality of renal insufficiency is 80 to 90 percent; most patients die within 8 days. The regeneration of the renal tubules is definite within 8 to 12 days and if the patient can be sustained through this period, recovery will be more frequent. They use the following procedure: Combat hypotension by adequate measures; limit the daily intake of fluid to that lost in order to maintain a near normal state of hydration; prevent acidosis by giving sodium bicarbonate as needed to maintain plasma bicarbonate at lower limits of normal; maintain CO₂ combining power of 50 volumes percent or higher; an excess of sodium bicarbonate is to be avoided; an intake of 1 calorie per cubic centimeter of fluid during the period of oliguria; assure full replacement of water and salt during the period of diuresis so as to prevent dehydration, electrolytic imbalance, and shock during this period.

Hingson and coworkers (11) report 35 patients with anuria from various causes treated with continuous caudal or spinal anesthesia. There were 8 deaths. They conclude that while the increase in urinary output in those cases with anuria seemed to be associated with the block of the sympathetic fibers to the level of sixth dorsal, much more work needs to be done with experimental renal clearance studies under various levels of block.

Findley (10) does not recommend high spinal anesthesia or splanchnic procaine block in the treatment of anuria. He believes that the gross renal edema in these patients is produced by administration of excessive amounts of fluid and recommends giving 500 cc. water and 4 gm. sodium chloride daily except when vomiting, sweating, or diarrhea increases the need for more. Saline requirements may be met by giving a low-protein high-carbohydrate beverage to which is added sodium chloride to meet physiologic requirements, but sodium chloride must be eliminated from the diet in the presence of edema. Fluids containing large amounts of sodium ions (citrate in blood transfusions) should be eliminated except in the presence of acidosis. Since death or recovery occurs within 20 days of onset, moderate degrees of acidosis or hypochloremia may be disregarded, but sharp reductions in plasma CO₂ and chlorides must be corrected. Pulmonary edema is treated by bleeding. Findley warns that parenteral administration of fluid is potentially dangerous, and condemns renal decapsulation.

This concept of fluid limitation, maintaining water and electrolyte balance, and the use of indicated supportive measures is recommended by many others (12) (13).

Stock (7) confirmed the findings of Trueta et al., of two alternate vascular routes through the kidneys. He found that the use of tetra-ethyl ammonium bromide in rabbits prevents the renal cortical ischemia which occurs from the application of nervous stimuli. He administered one gram of tetra-ethyl ammonium bromide intramuscularly every 6 hours for 24 hours, in treating hypertension of pre-eclampsia, and noted the return of blood pressure to normal for a period of 7 days in one of four cases; also by blocking both splanchnic nerves with procaine the blood pressure in the preeclampsia patient could be returned to normal in every instance. His good results with the use of tetra-ethyl ammonium bromide led him to believe that repeated large doses will be of value in treating the renal failure noted in crush injuries and in blackwater fever.

O'Sullivan and Spitzer (8) noted favorable results with use of posterior splanchnic block, in two cases of anuria associated with abortion.

Williams (9) treated a patient with Weil's disease showing renal failure: blood urea, 321 mg. per 100 cc. blood, blood pressure 100/70, age 61. By using measures to elevate blood pressure which was then followed by high spinal anesthesia, dramatic results were obtained. The blood urea level fell rapidly and the diuresis continued despite the fact that the effects of the spinal anesthesia wore off.

SUMMARY

Acute renal insufficiency is initiated by a renal shunt mechanism which produces a renal cortical ischemia. This mechanism is activated by a large variety of agents which act reflexly through the splanchnic innervation.

Man may survive for 4 weeks or more without renal function if excessive quantities of fluid are not administered (12). Histologic and clinical evidence indicate that healing of the renal tubular lesions and spontaneous diuresis may be expected within 3 weeks.

The treatment of acute renal insufficiency should be based upon: (a) measures that overcome hypotension and shock; (b) the maintenance of physiologic balance by careful laboratory control of electrolyte and water requirements; and (c) the use of procedures which block the renal nerve supply.

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OFFICERS OF THE MEDICAL DEPARTMENT

*Whose Deaths Have Been Reported Since
the Last Issue of the Bulletin*

CARR, JOHN GEORGE, Lieutenant (MC) U. S. N. R. (Inactive). Died 27 October 1946 at Homestead Hospital, Homestead, Pa.

EVANSON, JEROME CHARLES, Lieutenant, junior grade (MC) U. S. N. Died 19 November 1948 at U. S. Naval Hospital, Bremerton, Wash.

FULLER, JAMES EDWARD, Lieutenant Commander H(S) U. S. N. R. (Retired, Inactive). Died 27 October 1948 at U. S. Naval Hospital, Portsmouth, N. H.

HORNER, WARREN DOUGLAS, Captain (MC) U. S. N. R. (Retired, Inactive). Died 22 October 1948 at San Francisco, Calif.

JOHNSTON, RICHARD COOK, Lieutenant (MC) U. S. N. R. (Inactive). Died 15 November 1948 at Spokane, Wash.

KONEN, LLOYD WILLIAM, Lieutenant (DC) U. S. N. R. (Inactive). Died 16 July 1948 at Fond du Lac, Wis.

McELWAIN, CLIFFORD EDWARD, Lieutenant (MC) U. S. N. R. (Retired, Inactive). Died 20 July 1946 at Syracuse, N. Y.

STACK, EUGENE ANTHONY, Lieutenant Commander (MC) U. S. N. R. (Inactive). Died 1 December 1946 at Chicago, Ill.

STEVENS, ALEXANDER HAMILTON, JR., Commander (MC) U. S. N. R. (Inactive). Died 21 October 1948 at New Bern, N. C.

BOOK REVIEWS AND BOOKS RECEIVED



Publishers submitting books for review are requested to address them as follows:

The Editor,

UNITED STATES NAVAL MEDICAL BULLETIN,
Bureau of Medicine and Surgery, Navy Department,
Washington 25, D. C.

(For review)

NOTE: Books marked by symbol ①, ②, or ③ meet the library requirements for personnel training and are recommended by the Advisory Board, Bureau of Medicine and Surgery.

Symbol ① indicates that the book is recommended for naval hospitals; symbol ② for dispensaries; and symbol ③ for dependents service or for medical departments of ships.

BOOK REVIEWS

A MANUAL OF OTOTOLOGY, RHINOLOGY AND LARYNGOLOGY, by Howard Charles Ballenger, M. D., F. A. C. S., Associate Professor and Acting Chairman of the Department of Otolaryngology, Northwestern University School of Medicine, Chicago, Ill., Surgeon, Department of Otolaryngology, Evanston Hospital, Evanston, Ill. 3d edition, 352 pages, enlarged and thoroughly revised with 135 illustrations and 3 color plates. Lea & Febiger, Philadelphia, Pa., publisher, 1947. Price, \$4.50.

This is the third edition of a small concise manual on the diseases of the ear, nose, and throat. Its abbreviated manuscript covers the etiology, pathology, symptomatology, and generally accepted medical treatments of the nose and accessory sinuses, pharynx and fauces, larynx, and ear in such manner, as to be useful to medical students, interns and busy general physicians. The indications for surgical treatment are covered but no discussion of technique is involved except for minor surgery such as tracheotomy and myringotomy. The technique for hearing tests, audiometric tests, and labyrinth tests is described.

A new chapter has been added which covers headaches, migraine, histamine cephalalgia, and neuralgias of the face. Recent advances in treatment with antibiotics and antihistamine drugs is covered in separate paragraphs and mentioned, where applicable, in certain diseases.

—Capt. C. D. Riggs (MC), U. S. N.

HERNIA. ANATOMY, ETIOLOGY, SYMPTOMS, DIAGNOSIS, DIFFERENTIAL DIAGNOSIS, PROGNOSIS, AND TREATMENT, by Leigh F. Watson, M. D., F. I. C. S., Los Angeles; *Certified by the International Board of Surgery; formerly Associate in Surgery, Rush Medical College, Chicago; formerly Assistant Professor of Surgery, University of Oklahoma Medical School, Oklahoma City.* 3d edition. 732 pages with 323 illustrations. The C. B. Mosby Co., St. Louis, Mo., publishers, 1948. Price, \$13.50.

This well-printed book on the surgical and injection treatment of hernia, adds nothing to the medical literature. The sequence of presentation is rather confusing; there is a great deal of repetition and much verbiage; many statements referring to pre- and post-operative treatment appear to be the personal opinion of the author and are in conflict with the consensus, while many others require clarification and revision in the light of recent advances in physiology. This book has little to recommend it.

— Capt. J. L. Schwartz (MC), U. S. N.

AN INTRODUCTION TO THE HISTORY OF DENTISTRY, by Bernhard Wolf Weinberger, D. D. S., New York City. Vol. I, 514 pages, illustrated. Vol. II. (Washington's need for medical and dental care. Houdon's life mask versus his portraiture.) 408 pages, illustrated. The C. V. Mosby Co., St. Louis, Mo., publishers, 1948. Price, \$20.

This two-volume history is considerably more than an introduction to the subject, since it portrays the origin, evolution, and growth of dentistry from the mists of antiquity into the nineteenth century and is, undoubtedly, the first comprehensive work of its kind.

Volume 1 traces the development of dental practice from early medical specialization, as revealed by archaeological research and ancient records, through the evolution of an independent profession. The author disagrees with the commonly accepted idea that the modern dental surgeon is an off-shoot from the stock from which the general surgeon developed, namely, the Guilds of Barbers and Barber Surgeons, believing instead that the practice of the dental art is as old as that of medicine and so closely interwoven with it as to be often indistinguishable. Methods of dental practice which appeared in this country early in the nineteenth century were characterized more or less by quackery, and this development prompted the better educated and qualified dentists in 1834 to organize the first American dental society, the Society of Surgeon Dentists of the City and State of New York. Soon afterwards came the first dental journal (1839), and the first national society and dental college (1840).

In volume 2 the author reviews dentistry in America from 1620 and devotes chapters to Paul Revere and 10 other pioneers of the budding profession whose contributions have materially influenced the progress of dental science. One of these gentlemen, Josiah Flagg of Boston, may have been our Navy's first dental surgeon. He enlisted during the War of 1812, but was captured soon thereafter and practiced under parole for 2 years in London, where his excellent professional reputation had preceded him. Much material for volume 2 was collected through painstaking review of newspapers printed prior to 1800 and of private papers, letters, diaries, and account books of leading figures of the times. The thoroughness of this historical work, regardless of completeness of scope, together with its originality, as such, commends this "Introduction" to the history of American dentistry to a wide variety of readers.

Much information on early dental practice has been derived from paintings, etchings, and wood cuts, for the great artists were attentive to detail in portraying the life and people of their day. Thus, portraits of Washington lend pictorial support to the written records of the efforts of several early American prosthodontists to construct full upper dentures as well as partial lower re-

placements which were contrived to fit around our first President's last remaining mandibular "sinister premolar." Washington was beset with difficulties in his attempts to obtain satisfactory dentures between sessions of Congress. He had definite ideas as to how his dentures were to be designed and he even developed a considerable degree of skill in making and adjusting the powerful steel springs which held his dentures in position. One set of Washington's dentures weighed a pound and a half each, having lead alloy bases and elk's teeth as improvements upon the conventional ivory carvings. Gilbert Stuart was so dissatisfied with his 1795 portrait of the Father of His Country that in 1796, upon the completion of a new set of dentures by James Gardette, he painted another. The new set, however, employed hippopotamus ivory teeth and caused the peculiar appearance seen in Stuart's second picture. The President soon was in quest of new teeth.

This book is amply and interestingly illustrated and is featured by compilations of references at the ends of the chapters, chronological tables, lists of general reference works, and extensive medical and dental bibliographical and biographical data.

—Capt. H. R. Delaney (DC), U. S. N.

PRACTICAL BACTERIOLOGY, HEMATOLOGY, AND PARASITOLOGY, by Edward R. Stitt, M. D., Ph. M., Sc. D., LL. D., *Rear Admiral, Medical Corps, and Surgeon General, U. S. Navy, Retired*, Paul W. Clough, M. D., *Physician-in-Charge of the Diagnostic Clinic, and Assistant Professor of Medicine, Johns Hopkins University* and Sara E. Brauham, M. D., Ph. D., Sc. D., *Senior Bacteriologist, National Institute of Health, Professional Lecturer in Preventive Medicine, George Washington University School of Medicine*. 10th edition. 991 pages with numerous illustrations and colored plates. The Blakiston Company, Philadelphia, Pa., publishers, 1948. Price \$10.

There are probably no medical textbooks better known than Stitt's *Tropical Medicine* in this book. The first edition of this work came out in 1909 and it has become a necessity to the clinical laboratory worker everywhere.

This present revision contains every late development in laboratory methods, parasite cycles, and disease vectors. The editors fortunately have retained all the features that made every laboratory technician "swear by Stitt," such as: organ weights, tables of physiological normals, media, and other useful information for both the clinician and the laboratory worker.

—Capt. L. R. Roddis (MC), U. S. N.

ATLAS OF CARDIOVASCULAR DISEASES, Correlation of Clinical Electrocardiography and Cardiac Roentgenology with Clinical History and Autopsy Findings, by Irving J. Treiger, M. D., *Assistant Professor of Medicine, University of Illinois, Chicago; in charge of Cardiographic Department, Presbyterian Hospital, Chicago; Consulting Cardiologist, Municipal Tuberculosis Sanitarium, Chicago*. 180 pages with 69 plates containing 244 illustrations, 11 in color. The C. V. Mosby Co., St. Louis, Mo., publishers, 1947. Price \$10.

In this new book the author has correlated the salient points in the case histories, physical findings, roentgenological examinations, electrocardiograms, and full pictures of post-mortem cross-sections in representative cases of cardiovascular diseases.

The Atlas is divided into six parts; Normal Heart, Rheumatic Disease, Arteriosclerotic Heart Disease, Hypertension, Syphilitic Heart Diseases, and Congenital Anomalies.

The outline of the normal heart as depicted on the roentgenogram is shown next to pictures of the organ as it is situated in the chest from various views. This and the illustrations of the normal variations in position of the heart orient

the reader in the first part of the Atlas as to the method the author will use in his discussion of pathological cases.

In the remaining five parts typical instances of the various types of cardiovascular disease are discussed. The illustrations are excellent and the author has succeeded remarkably well in relating history, roentgenogram findings, physical examination, and electrocardiograms, with the autopsy. This pictorial presentation of cardiovascular disease is well done.

The student as well as the experienced clinician who is interested in cardiovascular diseases, will find this Atlas useful. While only characteristic instances of disease are presented, the author feels that with a thorough understanding of the natural causes the path to a comprehension of the complicated and complex is made easier.

—Commander J. B. Shuler (MC), U. S. N.

EXPERIMENTAL AIR-BORNE INFECTION, Equipment and Methods for the Quantitative Study of Highly Infective Agents: Basic Data on their Use Obtained With Phenol Red, *Serratia Marcescens* and *Bacillus Globigii*; and Preliminary Experiments on the stability and Infectivity for Laboratory Animals of Air-Borne Clouds of *Brucella Suis*, *Malleomyces Mallei*, *Malleomyces Pseudomallei*, *Pasteurella Tularensis*, and of Viruses of the Psittacosis Group, by Theodor Rosebury with the coauthorship and assistance of the staff of the Laboratories of Camp Detrick, Md. 222 pages, illustrated. The Williams & Wilkins Co., Baltimore, Md., publishers, 1947. Price \$4.

The Board of Editors of the Society of American Bacteriologists decided in May 1946 to renew its interest and efforts in sponsoring bacteriological monographs. It was further agreed to change the name of these publications to microbiological monographs. This is the first publication under the title of Microbiological Monographs.

This book describes new techniques and data as developed at Camp Detrick for the study of experimental air-borne infection. The building designed for this study houses two complete cloud-chamber units with safeguards to permit the study of highly infective agents, with accessory rooms and equipment for bacteriological preparations, for animal maintenance, autopsy and disposal, for animal cage processing, and for the washing and sterilization of glassware.

The safety of the methods has been demonstrated by experiments, using spore clouds, on leakage and on the persistence of contamination of animal coats, and by the use of normal animals held in contact with animals exposed to infective clouds. Methods have been developed for the quantitative study of infective clouds. These methods have been found in general to yield adequately reproducible data.

An investigation of atomizers, as they are used industrially and in studies of air-borne infection, and comparative experimental studies of several atomizer types, led to the adoption of an all glass, direct spray, peripheral air-jet instrument in preference to others, including more conventional "nebulizers." A simple collecting device ("impinger") used with an appropriate fluid medium, was found in comparative tests to be satisfactory for sampling clouds of all agents.

These methods have been applied in cloud chamber studies with *Bacillus globigii* spores and *Serratia marcescens*, and with the following infective agents *Brucella suis*, *Malleomyces pseudomallei* and *M. mallei*, *Pasteurella tularensis*, *meningopneumoniae* virus and three strains of psittacosis virus.

The data indicate that most of these agents, in the continuously flowing clouds studied, are more stable at relative humidities above 70 to 80 percent than when sprayed into a dry atmosphere, apparently because of the immediately destructive effect of drying.

Preliminary data are given for respiratory dosage of animals resulting in infection or death in 50 percent of exposed animals. Combined indexes of infectivity or lethality with stability to atomization are derived and compared for the bacterial agent studied.

This book will be of great interest to those concerned with the general field of experimental epidemiology.

—Commander E. E. Metcalfe (MC), U. S. N.

BRONCHIOGENIC CARCINOMA AND ADENOMA, with a chapter on Mediastinal Tumors, by
① B. M. Fried, M. D., Associate Attending Physician, Montefiore Hospital for Chronic Diseases, New York. 306 pages, illustrated. The Williams & Wilkins Co., Baltimore, Md., publishers, 1948. Price \$6.

This is a compact and highly informative book. The author uses figures from many sources, case histories, and roentgenograms in discussing incidence, clinical manifestations, diagnostic features, metastasis, and complicating conditions, and such factors as infection, chemical irritants (including tobacco), radiation, pneumoconioses, viruses, and trauma. Extensive bibliographies are available after each chapter.

The opinion is expressed that the increased incidence is more apparent than real and that medical progress, prolonged life expectancy, and increased attention to the disease are responsible for the fact that bronchiogenic carcinoma now ranks third in frequency among malignancies.

In addition to fundamental studies on physiologic and pathologic processes, the gross and microscopic characteristics of bronchiogenic carcinoma are presented. The author classifies them as hilar, peripheral, and apical (superior sulcus); these, by their position, may produce somewhat different pictures.

The role of the vertebral vein system in metastasis is presented, as explaining the frequency of brain and bone involvement.

A wide variety of symptoms and physical signs are evaluated, those relative to bronchial obstruction being most important. Differential diagnoses include pulmonary tuberculosis, pneumoconioses, lipid and infectious pneumonias, and asthma.

Clinically, Dr. Fried divides cases of lung cancer into three groups: (a) "Typical" cases, with respiratory manifestations; (b) "Atypical" cases, where extrapulmonary disturbances predominate (brain and cord metastases, Horner's Syndrome), and (c) "Silent" cases, so asymptomatic as to be discovered by accident or at necropsy.

The association of lung tumor with "pulmonary osteoarthropathy" is extensively discussed. The occurrence of endocrine disturbances due to such conditions as pituitary and adrenal adenomas in some of these cancer patients suggest some obscure relationship between the lungs and endocrine organs in producing skeletal changes.

The fluoroscopic and roentgenographic characteristics are noted; the use of bronchoscopy, needle biopsy, and stained smears of pleural effusions, sputum and bronchial secretions are described.

Although the radio-sensitive squamous-cell is the prevailing type of bronchiogenic carcinoma, radiation therapy is considered inferior to surgery. In any case, tardy inauguration of therapy, the poor condition of many patients, large size of tumors when discovered, and secondary infection make any adequate treatment difficult. Recent advances in thoracic surgery and anesthesia have reduced the operative risk greatly, and have made exploration worthwhile in many cases. Survival figures are still, unfortunately, discouraging.

The last two chapters deal with mediastinal tumors, and the controversial subject of bronchial adenoma. The differences between adenoma and carcinoma are presented; these being in age and sex incidence, clinical course and outcome. The general inadequacy of local therapy is pointed out.

—*Lt. (jg) F. W. Meyer, Jr. (MC), U. S. N.*

NUTRITIONAL AND VITAMIN THERAPY IN GENERAL PRACTICE, by Edgar S. Gordon, M. D., Ph. D., *Associate Professor of Medicine, University of Wisconsin*. 3d edition, revised. 410 pages, illustrated. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1947. Price \$5.

Four years have passed since the second edition of this book appeared. Progress in the field of nutrition and the means of combating the so-called deficiency diseases has continued. The text deals with the dietary deficiency conditions in a clear concise manner. Adequate space is devoted to diagnostic methods and the latest in therapy.

A chapter is devoted to the mineral elements required in the diet to prevent the development of dietary deficiency disease. The role protein plays in human nutrition is covered in a chapter as is also the importance of fuel foods and fats.

An appendix lists some of the commercial vitamin preparations available, and lists in a comprehensive table the nutritive value of 274 food items.

There are in all 19 chapters which, in addition to the medical aspects of nutrition, deal with the dental problems in nutrition and also the economic side of clinical nutrition.

Malnutrition is a condition commonly seen in general practice; this excellent book on nutrition will be of practical value to the clinician.

—*Capt. H. G. Shepler (MC), U. S. N.*

DERMATOLOGY IN GENERAL PRACTICE, by Sigmund S. Greenbaum, B. S., M. D., F. A. C. P., *Professor of Clinical Dermatology and Syphilology, University of Pennsylvania Graduate School of Medicine, Dermatologist, Philadelphia General Hospital, Eagleville Sanatorium, Philadelphia Psychiatric Hospital, Bamberger Seashore Home, Atlantic City; Betty Bacharach Home, Atlantic City; Rush Hospital, and Camden General Hospital; Consultant Dermatologist, Mount Sinai Hospital, formerly Consultant Dermatologist to United States Veterans' Administration. Fellow, American Academy of Dermatology and Syphilology, Diplomate of American Board of Dermatology and Syphilology, and 7 contributors*. 889 pages, 846 illustrations, 20 in color. F. A. Davis Co., Philadelphia, Pa., publishers, 1947. Price \$12.

This work is "designed for the busy practitioner, the undergraduate and for all those who from time to time may require information on the major clinical, diagnostic and therapeutic facts about a particular dermatosis."

One is impressed with the ease and freedom from burdensome verbiage with which the text may be read. Each disease or condition is described simply, almost in an epitomized way, yet fully and adequately, so that the reader may grasp the matter quickly and not be bogged down with words and long sentences. There is good type with wide spacing between the lines making for facile visibility.

The descriptive text is closely accompanied by black and white illustrations that are excellent and one may compare them with the text as he reads.

—*Capt. W. E. Eaton (MC), U. S. N.*

PSYCHOLOGICAL MEDICINE, by Desmond Curran, M. B., F. R. C. P., D. P. M., *Psychiatrist and Lecturer in Psychological Medicine, St. George's Hospital, and Honorary Psychiatrist to the Maida Vale Hospital for Nervous Diseases, London; Temp. Surgeon Captain, R. N. V. R. and Consultant in Psychological Medicine to the Royal Navy, and Eric Guttman, M. D., M. R. C. P., Neuropsychiatric Specialist, Emergency Medical Service; Formerly Research Psychiatrist, the Maudsley Hospital, London; Research Neuropsychiatrist, Nuffield Dept. of Surgery, Oxford; Psychiatrist to the Officer Board, National Fire Service*. Foreword by J. J. Conybeare, M. C., D. M.

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(Oxon.), F. R. C. P., *Physician to Guy's Hospital, London*. A short introduction to Psychiatry with an appendix on psychiatry associated with war conditions. 2d edition. 246 pages, illustrated. The Williams & Wilkins Co., Baltimore, Md., publishers, 1945. Price \$3.50.

The authors emphasize in the preface to the second edition of this volume that it is to be considered "a short introduction to psychiatry." It is doubtful whether the material presented in the eighteen chapters would be of significant value to the general practitioner other than in an emergency situation such as many medical officers faced during World War II. The material presented is cursory and aims only at giving the nonpsychiatrically oriented physician a brief study of the field. Illustrations and concrete observations are limited to the British culture, and in many instances psychiatric terminology is not founded on the present day concepts of personality dynamics in the United States.

The brevity with which many topics are treated must be cautiously evaluated since medical officers not trained in psychiatry may be inclined to take such treatment seriously, whereas, the authors intended their treatment only as a brief review. An example is Chapter XIV of four pages on "The Legal Aspects of Mental Illness."

The format and size of print are superior to the average book, and the index is considered adequate for the material covered.

—Commander T. A. Harris (MC), U. S. N.

THE NATURAL HISTORY OF DISEASE, by John A. Ryle, M. A., M. D., F. R. C. P.,
① *Professor of Social Medicine in the University of Oxford; Consulting Physician to Guy's Hospital, London, and the Radcliffe Infirmary, Oxford; Formerly Regius Professor of Physic in the University of Cambridge*. 2d edition, 484 pages. Geoffrey Cumberlege Oxford University Press, New York, N. Y., publishers, 1948. Price \$7.50.

A keen, astute and philosophic presentation of diagnosis and prognosis in general practice and of diagnosis and treatment in certain clinical entities including pain, the common gastric symptoms, duodenal ulcer, diarrheas, Bright's disease, angina pectoris, and allied seizures, and some of the neuroses.

Dr. Ryle urges the physician to emulate the naturalist; to observe, to record, and to deduce. He stresses the necessity for a thorough and complete history and physical examination, and on the need for a logical correlation of the symptoms of the disease with the concepts of physiology and pathology; that by obtaining a fuller knowledge of symptoms, an early diagnosis can be made with less dependence on the laboratory. As he so aptly states "much unnecessary and unwise treatment, both medical and surgical, might be avoided even now if physicians and surgeons were less wedded to medicines, injections and techniques, and less susceptible to the impulse 'to do something' in anxious situations, schooled themselves better in the knowledge of the natural course and eventualities of disease upon which all sound prognosis and treatment depends."

This book should be read by every physician and every intern.

—Capt. J. L. Schwartz (MC), U. S. N.

COMMUNICABLE DISEASE CONTROL, A Volume for the Health Officer and Public Health Nurse, by Gaylord W. Anderson, A. B., M. D., Dr. P. H., *Mayo Professor and Director, School of Public Health, University of Minnesota; Formerly Director, Medical Intelligence Division, Office of the Surgeon General, War Department; Formerly Deputy Commissioner, and Director of the Division of Communicable Diseases, Massachusetts Department of Public Health; and Margaret G. Arnstein, R. N., M. A., M. P. H., Assistant to the Chief, Division of Nursing, United States Public Health Service; Formerly Consultant in Communicable Disease Division, New York State Department of Health; Formerly Associate Professor of Preventive Medicine and Public Health and Director of the Course in Public Health Nursing, University of Minnesota*. 2d edition, 450 pages, illustrated. The Macmillan Co., New York, N. Y., publisher, 1948. Price \$5.

The first edition of this work which appeared in 1941 was accorded an important position in the libraries of workers in the field of public health. The second edition follows the same plan of presentation of the contained material and should prove equally valuable. The recent advances in the use of the sulfonamides, antibiotics and the new antigens have been incorporated and a new chapter on rheumatic fever has been added.

The book has been written from the standpoint of the health officer in the United States whose problem is to provide control of disease in the American community in a manner that is practical, economical, and efficient. Part 1 is devoted to a discussion of the general aspects of infectious disease, control practices, epidemiological techniques, and administrative procedures, and part 2 deals with the practical application of control measures in specific diseases. Since tropical and exotic diseases are not common problems in the United States very little information on control measures used against them is included.

The book will be an authoritative and valuable source of information to health officers and nurses, and to general practitioners who are called upon to play an important part in the protection of their communities against communicable diseases. The bibliography and list of suggested reading has been brought up to date and will provide additional sources of pertinent information.

—Capt. F. C. Greaves (MC), U. S. N.

BOOKS RECEIVED

A CONCISE COMPARATIVE ANATOMY, by William Henry Atwood, *Head of the Department of Biology, Milwaukee State Teachers College*. 413 pages, 303 illustrations. The C. V. Mosby Co., St. Louis, Mo., publishers, 1947. Price \$3.75.

INTRACRANIAL TUMORS, by Percival Bailey, *Professor of Neurology and Neurological Surgery, University of Illinois*. 2d edition. 478 pages, illustrated. Charles C Thomas, Springfield, Ill., publishers, 1948. Price \$10.50.

RECENT ADVANCES IN MEDICINE, Clinical, Laboratory, Therapeutic, by G. E. Beaumont, M. A., D. M. (Oxon.), F. R. C. P., D. P. H. (Lond.), *Physician to the Middlesex Hospital; Physician to the Hospital for Consumption and Diseases of the Chest, Brompton; Lecturer in Medicine, Middlesex Hospital Medical School*; and E. C. Dodds, M. V. O., D. Sc., Ph. D., M. D., F. R. C. P., F. R. I. C., F. R. S. (Edin.), *F. R. S., Courtauld Professor of Biochemistry in the University of London; Director of Courtauld Institute of Biochemistry, Middlesex Hospital*. 12th edition. 422 pages, illustrated. The Blakiston Co., Philadelphia, Pa., publishers, 1947. Price \$6.

PEDIATRIC NURSING, by Gladys S. Benz, R. N., B. S., M. A., *Associate Director, Union University School of Nursing, Albany, New York; formerly Head Nurse, University Hospital, Minneapolis; Head Nurse, Sarah Morris Hospital (Children's Division of Michael Reese Hospital), Chicago; Supervisor and Assistant Superintendent of Nurses, St. Louis Children's Hospital; Nurse, Institute of Child Welfare, University of Minnesota; Instructor in Nursing Education, Summer School, University of North Carolina*. 638 pages, with 119 illustrations. The C. V. Mosby Co., St. Louis, Mo., publishers, 1948. Price \$4.

POLIO AND ITS PROBLEMS, by Roland H. Berg, with a foreword by Basil O'Connor, President. The National Foundation for Infantile Paralysis, Inc. 174 pages, 24 illustrations. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1948. Price \$3.

MEDULLARY NAILING OF KÜNTSCHER, by Lorenz Böhler, M. D., *Director of the Hospital for Accidents in Vienna; Professor of Surgery at the University of Vienna*. First English edition revised by the author. Translated from the Eleventh German Edition by Hans Tretter, M. D., *Surgeon in Charge of the New Jersey Manufacturers Hospital, Active Consultant in Traumatic Surgery at the Orthopaedic Hospital, Trenton, N. J.; former Assistant to Dr. Böhler at the Hospital for Accidents in Vienna; former Demonstrator of Anatomy, University of Graz, Austria*. 386 pages illustrated. The Williams & Wilkins Co., Baltimore, Md., publishers, 1948. Price \$7.

- A PRIMER OF CARDIOLOGY**, by George E. Burch, M. D., F. A. C. P., *Associate Professor of Medicine, Tulane University School of Medicine; Senior Visiting Physician, Charity Hospital; Consultant in Cardiovascular Diseases, Ochsner Clinic; Visiting Physician, Touro Infirmary, New Orleans*, and Paul Reaser, M. D., *Instructor in Medicine, Tulane University School of Medicine; Assistant Visiting Physician, Charity Hospital, New Orleans*. 272 pages, 203, illustrations. Lea & Febiger, Philadelphia, Pa., publishers, 1947. Price \$4.50.
- TEXTBOOK OF MICROBIOLOGY**, by Kenneth L. Burdon, Ph. B., Sc. M., Ph. D., *Professor of Bacteriology and Immunology, Baylor University College of Medicine, Houston, Tex.; Consultant in Bacteriology, Methodist Hospital, Houston*. 3d edition, revised. 728 pages, illustrated. The Macmillan Co., New York, N. Y., publishers, 1947. Price \$3.50.
- BRIGHT'S DISEASE**, by Henry A. Christian, A. M., M. D., LL. D., Sc. D. (Hon.), M. A. C. P., Hon. F. R. C. P. (Can.), D. S. M. (Am. Med. Assoc.) *Hersey Professor of the Theory and Practice of Physics, Emeritus, Harvard University; Sometime Clinical Professor of Medicine, Tufts College Medical School, Physician-in-Chief, Emeritus, Peter Bent Brigham Hospital; Sometime Visiting Physician, Beth Israel Hospital, Boston, Mass.* 340 pages, illustrated. Oxford University Press, New York, N. Y., publishers, 1948. Price \$9.
- NEUROLOGY OF THE OCULAR MUSCLES**, by David G. Cogan, M. D., *Associate Professor of Ophthalmology, Harvard Medical School, Director, Howe Laboratory of Ophthalmology, Boston, Massachusetts*. 214 pages, illustrated. Charles C Thomas, Springfield, Ill., publishers, 1948. Price \$6.
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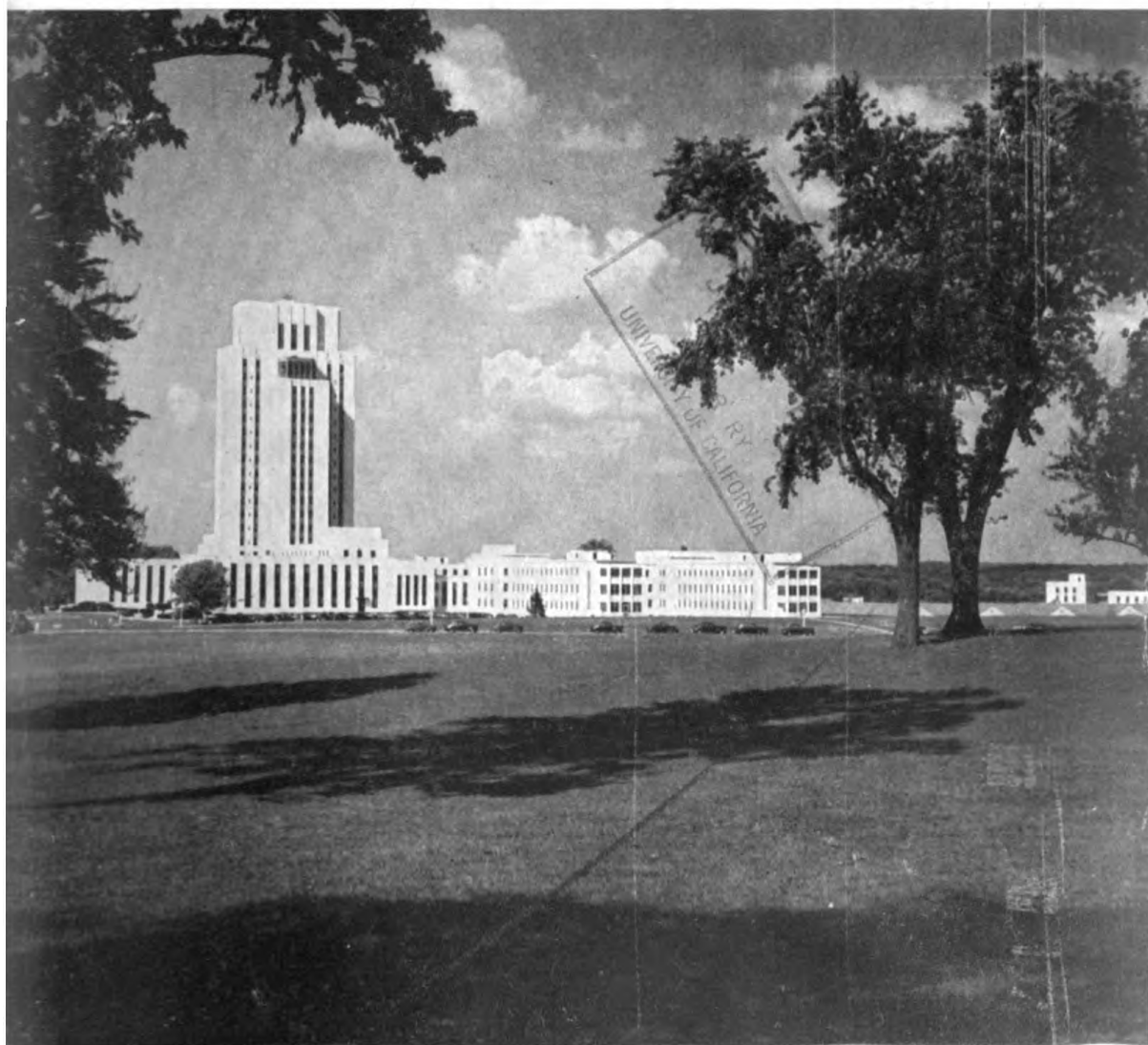


May-June 1949

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Bethesda, Md., the hub of naval medicine
in peace and war.***

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Vol. 49

MAY-JUNE 1949

No. 3

UNITED STATES NAVAL MEDICAL BULLETIN

THE MISSION OF THE MEDICAL DEPARTMENT OF THE NAVY
TO KEEP AS MANY MEN AT AS MANY GUNS
AS MANY DAYS AS POSSIBLE



BIMONTHLY

DIVISION OF PUBLICATIONS
BUREAU OF MEDICINE AND SURGERY
JOSEPH L. SCHWARTZ, Captain (MC) U. S. N., Editor

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NAVY DEPARTMENT,
Washington, March 20, 1907.

THIS UNITED STATES NAVAL MEDICAL BULLETIN is published by direction of the Department for the timely information of the Medical and Hospital Corps of the Navy.

TRUMAN H. NEWBERRY,
Acting Secretary.



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PREFACE



The UNITED STATES NAVAL MEDICAL BULLETIN was first issued in April 1907 as a means for supplying Medical Department personnel of the United States Navy with information regarding the advances which are continually being made in the medical sciences, and as a medium for the publication of accounts of special researches, observations, or experiences of individual medical officers.

With the establishment of the Nurse Corps in 1908, the Dental Corps in 1912, and the Medical Service Corps in 1947, the function of the BULLETIN was broadened to serve in a similar capacity for members of those Corps.

It is the aim of the Bureau of Medicine and Surgery to furnish in each issue special articles relating to naval medicine and dentistry, editorial comment on current literature of special professional interest to Medical Department personnel, clinical notes on interesting cases, descriptions of suggested devices, reports from various sources, notes and comments on topics of professional interest, and notices of newly published professional books.

The Bureau extends an invitation to all officers of the Medical Department to prepare and forward, with a view to publication, contributions on subjects of professional interest.

The Bureau does not necessarily undertake to endorse views or opinions which may be expressed in the pages of this publication.

CLIFFORD A. SWANSON,
Surgeon General, United States Navy.

III

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JOSEPH L. SCHWARTZ, *Editor,*
Captain, Medical Corps,
United States Navy.

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Oral Surgery Seminar



—Official United States Navy Photograph

One of the seminars routinely conducted by the Oral Surgery Department of the U. S. Naval Dental School, Bethesda, Md. The instructor is Commander T. A. Lesney (DC) USN, Chief, Department of Oral Surgery, Naval Dental School.

ADDRESS YOUR REPLY TO
BUREAU OF MEDICINE AND SURGERY
NAVY DEPARTMENT, WASHINGTON 25, D. C.
AND REFER TO



18 May 1949



WASHINGTON 25, D. C.

Fellow Officers of the Medical Department:

The remarkable progress in the training of dental personnel recently made by the Dental Corps should be of interest to all officers of the Medical Department.

The Dental Internship Training Program was established in the Navy in August 1948. Dental rotating internships of 12 months duration are now available at the National Naval Medical Center and at the naval hospitals at St. Albans, Philadelphia, San Diego, Long Beach, Oakland, Great Lakes, and Portsmouth, Virginia.

All dental officers are encouraged to apply for short refresher and post-graduate courses such as those available at civilian dental schools. Sixty-seven courses of this type were approved for dental officers during the year 1948. In the same period 51 dental officers attended graduate and post-graduate courses of instruction for six months or longer, 32 received training at the Naval Dental School, 17 at civilian universities, one at the Industrial College of the Armed Forces, and one at the Naval War College.

Another training accomplishment of the Dental Corps in 1948 was the establishment of Class A Dental Technician Training Schools at the Naval Training Centers, Great Lakes and San Diego, and at the National Naval Medical Center. At the same time a Class C Dental Prosthetic Technician School and a Class C Dental Repair School were established at the National Naval Medical Center. Also, since September 1948 requests have been approved for the training of dental technicians at civilian colleges in various undergraduate subjects.

During 1948 402 inactive reserve dental officers received active duty training for periods of two weeks. Of these, 107 attended special courses at the Naval Dental School, 215 received training in the dental department of naval shore activities, and 85 participated in training cruises. Since January 1948 more than 75 Volunteer Dental Units, each composed of 25 reserve dental officers, one reserve Medical Service or Hospital Corps officer, and 44 reserve dental technicians, have been established for the primary purpose of providing peacetime training.

It is gratifying to realize that in spite of the present acute shortage of dental personnel, the Dental Corps has maintained a program which insures the high professional level of the naval dental service.

Sincerely,

A handwritten signature in cursive script, likely of a Rear Admiral in the Medical Corps.

Rear Admiral, Medical Corps
Surgeon General, U. S. Navy

U. S. NAVAL MEDICAL BULLETIN

VOL. 49

MAY—JUNE 1949

No. 3

ARTICLES



Sarcoidosis

Report of Six Cases

IRWIN L. NORMAN, *Captain (MC), U. S. N.*

WILLIAM SHOEMAKER, *Lieutenant junior grade (MC), U. S. N. R.*

SARCOIDOSIS, or benign lymphogranuloma, was first described in the literature by Hutchinson in 1898. He reported several cases of a peculiar skin disease characterized by a granulomatous infiltration. Besnier in 1889 and in 1912 reported several cases with similar skin lesions involving the ear, nose, and fingers, which he thought might be due to tuberculosis and which he termed "lupus pernio." In 1899 Boeck described and classified the skin lesions, described the histological features, pointed out that the lymph nodes and mucous membranes may also be involved and proposed the name "sarcoid." Schaumann, in 1914, recognized the systemic nature of the disease and demonstrated the typical pathological picture in the tonsils, bones, lungs, and other viscera. The systemic nature of the disease was confirmed by Kuznitski and Bittorf in 1915 and later by Jungling.

Heerfordt in 1909 described a variation of the disease with involvement of the eye, parotid glands and facial nerve which he described as the uveoparotid syndrome. However, it was not until 1938 that Pantrier recognized the relation of the uveoparotid syndrome and the skin lesions of sarcoidosis.

ETIOLOGY

The cause of sarcoidosis is unknown but many authors have associated it with tuberculosis because of the similarity of the pathological

picture. It is thought by many to be a manifestation of an anergic state of tuberculosis, inasmuch as from 60 to 80 percent of the patients with sarcoidosis are negative to tuberculin, even in large doses (1). It also has been frequently observed that the lesions of sarcoidosis disappear if the patient develops active tuberculosis. Schaumann believed that an atypical or non-acid-fast phase of the tubercle bacillus might be the etiological factor. In support of this hypothesis he cultured a pleomorphic non-acid-fast bacillus from sarcoid lesions which on passage through animals becomes acid fast.

Pinner (2), reviewing all the cases reported in the literature upon which autopsies had been performed, found that the tubercle bacillus was found in only 11 of 43 autopsies, or 25 percent. He also found that in this group of cases tuberculosis was the cause of death in only 5; but it was his conclusion that there was a close etiological relationship between the 2 diseases. Hogan (3), however, using almost the same data as Pinner, believes that sarcoid is probably not an atypical form of tuberculosis inasmuch as it is inconceivable that the tubercle bacillus would remain undetected in such a high percentage of cases if it were of etiological significance.

Filho (4) has described a clinical picture resembling sarcoidosis in lepers, including skin, bone, and lymph node lesions and he suspected that *Mycobacterium leprae* might be incriminated as an etiological factor.

Weeks and Smith (5) and Harrell and Horne (6) performed skin tests on sarcoid patients using lepromin. Harrell reported on a series of 10 sarcoid patients in which there were late positive reactions to lepromin in 4 patients who also had tuberculosis. Harrell concluded that active tuberculosis produced false positive reactions to lepromin and that there was no evidence that sarcoidosis was caused by an atypical form of *M. leprae*.

Williams and Nickerson (7) suspected that the causative agent might be a filterable virus on the basis of the development of an erythematous reaction following the intradermal injection of an emulsion of a sarcoid nodule into four affected patients.

Harrell (8) raised the question of an allergic factor, inasmuch as an eosinophilia is frequently found in sarcoid patients. He believed that the disease was due to a nonspecific response to small amounts of a lipoid fraction of a variety of organisms, such as the tubercle bacilli.

Kveim (9) performed skin tests using as an antigen material prepared from sarcoid infiltration of skin and lymph nodes. He found a positive cutaneous reaction in sarcoid patients consisting of an erythematous papule arising 4 weeks to 2 months after injection. Warfvinge (10) injected an antigen of killed tubercle bacilli in two patients with sarcoidosis and produced a skin reaction the size of a pep-

percorn with the typical histological pattern of sarcoid. In control patients who had active tuberculosis without sarcoidosis, there appeared a small papular wheal which remained for several weeks to several months. Histological examination of these controls showed a nonspecific reaction.

Longcope (11) attempted unsuccessfully to culture fungi from sarcoid lesions.

PATHOLOGY

Histologically Boeck's sarcoid resembles tuberculosis. The essential pathologic picture is that of a granulomatous nodule which histologically is distinguished by clusters of large pale epithelial cells with occasional giant cells. When giant cells are present they are very large, containing up to 20 nuclei. The nodule is not sharply demarcated and is infiltrated with lymphocytes. The absence of either caseation or necrosis serves to distinguish the nodule from that of tuberculosis. The process is further characterized by its inactivity, as months may pass without any histologic change. In the early lesions there is little fibrosis, but lesions which have been present for a long time may show fibrosis with occasional hyalinization of the fibrous tissue.

Sarcoid lesions are found most frequently in the lungs, the lymph nodes, and skin, but may be found in any organ of the body, including the structures of the eye, salivary glands, lacrimal glands, tonsils, lungs, bones, mucous membranes, breast, thyroid, heart, liver, intestines, spleen, kidney, endometrium, prostate, testis, epididymus, muscle, tendon sheaths, and serous membranes.

Widespread disturbances of physiological function may occur as a result of sarcoid infiltration into the various organs and organ systems. Diabetes insipidus has resulted from involvement of the pituitary gland, as has myxedema from sarcoid involvement of the thyroid and eunuchoidism from testicular involvement. Tachycardia, various arrhythmias, and even cardiac failure have been reported as a result of cardiac infiltration. Massive pulmonary sarcoidosis has been thought to have produced right heart strain with cor pulmonale and secondary polycythemia. The hyperglobulinemia that frequently occurs is a result of liver involvement. Uremia due to kidney involvement has been described and albuminuria and hematuria are common findings.

CLINICAL PICTURE

Sarcoidosis is usually found in the younger age groups, most commonly between the ages of 12 and 40, although it may occur at all ages. The disease pursues an indolent course and is manifest in a multiplicity of clinical forms. The disease affects both sexes equally.

All races are affected but there seems to be a predilection for the Negro race. The disease is primarily one of the North Temperate Zone. The rare occurrence in siblings suggests that it is not communicable. Sarcoidosis usually is not attended by constitutional reactions. Fever is unusual, even in cases with considerable involvement. Vague inconstant gastro-intestinal symptoms, diarrhea, anorexia, and malaise may be present. Many of the symptoms which may occur are due to sarcoid infiltration which may occur in widely separated systems with consequent disturbance and interference of function.

Lymphadenopathy is usually present and may be generalized or limited to one or more areas, as in the cervical, axillary, or hilar regions. The peripheral lymph nodes are nontender, firm, discrete, and are usually not fixed to the skin or underlying tissues, making biopsy an easy diagnostic procedure. Besnier (13) reported superficial lymphadenopathy in all his 35 cases. Longcope (14) found enlarged intrathoracic lymph nodes in 30 of his 31 cases. McCort et al (15), in a series of 28 cases found enlarged paratracheal lymph nodes in all 28 and enlarged peribronchial nodes in 25. Enlarged paratracheal and peribronchial lymph nodes are frequently associated with pulmonary infiltration. This gives a characteristic roentgenogram which frequently suggests the diagnosis.

Pulmonary sarcoidosis, which is one of the frequent manifestations, may produce cough, dyspnea, blood-streaked sputum, dullness to percussion, bronchial breath sounds, râles, and occasionally a low grade fever. Extensive pulmonary infiltration with enlarged hilar lymph nodes may occur however with a few objective findings and a few symptoms.

Skin lesions occur in approximately 50 percent of cases. Boeck described three types of skin lesions: the Klein-Knotige, which consists of small firm nodules usually found on the face, arms, or trunk; these nodules are blue or violaceous in color and are smooth and sharply demarcated. The Gross-Knotige nodules are similar but larger. The third type consists of a diffuse bluish infiltration usually found over the nose, face, and ears; the bluish areas of infiltration have tiny yellow granules at the margins. These cutaneous sarcoid lesions are neither pruritic or painful. They are not surrounded by erythema or any induration. The lesions have a high degree of chronicity; they may leave atrophic scars but have never been known to ulcerate.

The hands and feet may show firm nodules at the interphalangeal joints. These nodules are usually symmetrical. There may be stiffness and tightness of the fingers, but there is never any pain or tenderness. The joints may be grossly deformed and mutilated but the bony lesions never ulcerate or produce fistulae.

Many of the symptoms are due to infiltration of organs with interference of function. Myocardial involvement may produce ar-

rhythmias including bundle branch block and actual myocardial failure as reported by Longcope and Fischer (11), Salvesan (16), and Schaumann (17). Crone and Zetlin (18) describe a case of Boeck's sarcoid associated with hemolytic anemia and hyperglobinemia, which recurred following splenectomy. Death in this case occurred during a hemolytic crisis. Rotenburg and Guggenheim (19) reported a case of Boeck's sarcoidosis in which renal insufficiency and hypertension were associated with extensive sarcoid infiltration of the kidneys. Hepatomegaly and splenomegaly are frequently encountered. Watson, Rigler, Wangensteen, and McCartney (20) reported sarcoid infiltrations of the small intestine simulating regional ileitis.

UVEOPAROTID SYNDROME

A well-defined type of sarcoidosis called uveoparotid syndrome has been described. This syndrome involves the parotid glands, the ocular structures, and frequently the cranial nerves. A prodrome of malaise, drowsiness, intermittent fever, and occasionally gastro-intestinal symptoms precede the parotid involvement. There is painless swelling of the parotid glands, which is usually bilateral, although both parotids are not necessarily affected simultaneously. Induration of the parotid glands with zerostomia is present in the active stage; the induration is usually of temporary duration. Ocular involvement usually follows, but occasionally may precede the appearance of the parotid lesions. Uveitis is by far the most characteristic lesion of the ocular disorders. Conjunctivitis, keratitis, chorioretinitis, neuroretinitis, aqueous turbidity, and glaucoma have been reported (21). The corneal lesions usually heal completely, but may leave scars or synechiae. Visual disorders of sarcoidosis may persist and they infrequently may leave permanent residual damage, including blindness.

The third component which is characteristic of uveoparotid syndrome, is cranial nerve involvement. Most commonly there is a facial palsy, which makes its appearance either unilaterally or bilaterally a few days to a few months after the parotitis appears. When the facial nerve is involved, the lower branches are more frequently involved than the upper branches. The nerve lesion usually subsides at the same time as the parotitis, although it may persist after the recovery from the parotitis. Dysphagia, paralysis of the vocal chords and soft palate, intercostal neuralgia, deafness, ptosis of the lid and polyneuritis may be associated with uveoparotid syndrome.

LABORATORY FINDINGS

The laboratory findings are not characteristic but may give a clue to the nature of the disease. The most common laboratory finding is an increase of the plasma protein which is due to an increase of the

globulin fraction. Frequently there is a reversal of the albumin globulin ratio due to the great increase in globulin. There frequently is a hypochromic microcytic anemia of moderate degree. The white blood count is normal or slightly depressed. With infiltration of the spleen there frequently is a leukopenia. There may be a transitory eosinophilia of mild degree. Harrell (8) states that repeated differential blood counts may show an increased number of large mononuclear cells. The sedimentation rate is usually increased. In two cases described by Harrell, there was a protein similar to Bence-Jones protein in the urine. He also states that there is almost always an increase in the blood calcium and alkaline phosphatase.

ROENTGEN RAY FINDINGS

The roentgen ray findings in the lungs are of several types. The most common type is that of enlargement of the tracheobronchial lymph nodes with fibrotic strands extending out from the hilus along the peribronchial structures. A second type is that of patchy areas of increased density especially in the bases. A soft type of infiltration resembling pneumonic tuberculosis has been described. Infrequently large cavities are found (25). There may be minute diffuse infiltrations closely resembling those of miliary tuberculosis (26).

There is usually little or no correlation between the roentgen ray findings and the severity of the process, as the roentgenogram shows only the sarcoid infiltrations in the lungs and bones. The pulmonary lesions usually completely resolve and disappear.

In 10 to 20 percent of the patients there is involvement of the bones of the hands and feet demonstrable by roentgenogram. The sarcoid infiltrations are usually found in the shafts of the phalanges and metacarpal bones and on roentgenogram show as punched-out areas, without involvement or change in the surrounding bone. These bony changes have been called osteitis tuberculosa multiplex cystoides. There is no involvement of the joints or periosteum. Biopsies and observations at autopsy show that the bones are much more frequently involved than is evidenced by roentgenographic studies. The bony infiltrations tend to resolve slowly.

DIAGNOSIS

The diagnosis of Boeck's sarcoid is not difficult if there is a strong index of suspicion. In cases with skin lesions the dermatologist usually is the first to make the diagnosis. In cases with pulmonary infiltration and hilar lymphadenopathy the radiologist's findings give the clinician the clue to the diagnosis which is confirmed when the characteristic pathological findings are noted on biopsy of peripheral

lymph nodes or areas of skin infiltration. The uveoparotid syndrome when present, is characteristic. In suspected cases the roentgenogram shows punched-out areas in the metacarpal and phalangeal bones. The presence of a hyperglobulinemia tends to confirm the diagnosis. In cases with a positive tuberculin test and roentgenographic evidence of pulmonary infiltration, the differential diagnosis from tuberculosis may be difficult. However, in sarcoidosis the almost complete lack of constitutional symptoms and the absence of tubercle bacilli in the sputum are helpful in arriving at a correct diagnosis. The Kahn and Wasserman tests are of value in ruling out syphilis. The bony lesions in tuberculosis and syphilis have periosteal thickening which is absent in sarcoidosis.

Leprosy should be considered if the cutaneous involvement is extensive. Miliary tuberculosis and silicosis must be differentiated if there is a small nodular type of pulmonary infiltration.

In coccidioidomycosis there frequently may be intrathoracic lymphadenopathy with pulmonary infiltration which may resemble sarcoidosis. Coccidioidomycosis can be differentiated by the history of living in an endemic area and the finding of a positive skin test with a positive precipitin or complement fixation test, or by identifying the fungus in the sputum. As has been pointed out by McCort et al. (15) the roentgenogram appearance of erythema nodosa with hilar lymphadenopathy may be difficult or impossible to differentiate from sarcoid if there are no other clinical manifestations.

TREATMENT

The spontaneous periods of remissions in the natural course of the disease make it difficult to evaluate any of the many types of therapy that have been used in treating Boeck's sarcoid and its manifestations. Many specific agents have been tried but none have proved to have any lasting value. Arsenicals, iodides, gold salts, tuberculin, leprosal, and hyperpyrexia have been tried without success. High voltage roentgen therapy, carbon dioxide snow, radium, and ultraviolet light have been used in treating skin lesions. High voltage roentgen therapy is frequently used in treating the pulmonary manifestations as well. Recently calciferol has been used in treating the skin lesions with indifferent success. The lack of a specific therapy makes general supportive treatment valuable.

PROGNOSIS

Sarcoidosis usually runs a chronic benign course with many exacerbations and remissions. There is a mortality of about 5 percent. Death is due to involvement or infiltration of a vital organ with change or impairment of physiological function. Approximately 10 percent

of patients with sarcoidosis develop active tuberculosis. Recovery occurs spontaneously in the majority of cases and complete cure has been reported in as short a period as from 5 to 27 months (1).

During the past several years there have been six cases of Boeck's sarcoid at a naval hospital. These six cases, although not sufficient in number to permit statistical evaluation, tend to bear out the contention of McCort et al. (15), that lymphadenopathy is the most constant finding of sarcoid. Two cases showed involvement of the skin. Five of the six cases showed pulmonary involvement. All six cases were proved by biopsy. In none of the cases was there demonstrable osseous involvement.

CASE REPORTS

Case 1.—F. S. M., a 19-year-old male, was admitted to the hospital on 9 December 1946 complaining of hemoptysis. Five weeks prior to entrance he noted a sharp pain in the left upper quadrant of the abdomen, radiating up to the middle of the chest anteriorly. He began to cough up bright red blood and within 10 minutes he brought up approximately 100 cc. of blood and sputum. In the 5 weeks preceding entrance he noted generalized malaise, anorexia, irritability, and a mild cough. Five days prior to admission to the hospital he coughed up a small amount of blood-streaked sputum which he believed came from his nose. There had been no loss of weight.

His past history includes the usual childhood diseases. In the past three summers the patient worked in his father's gravel mill, pouring shale into a rock-crushing machine. This job was described as being very dusty; no dust-protective devices were used. The family history and system review are non-contributory.

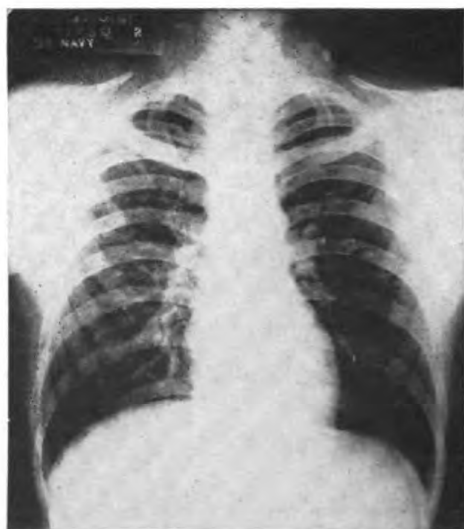


Figure 1.—Case 1, showing bilateral fibrotic pulmonary infiltration with bilar lymphadenopathy, more marked on the right.

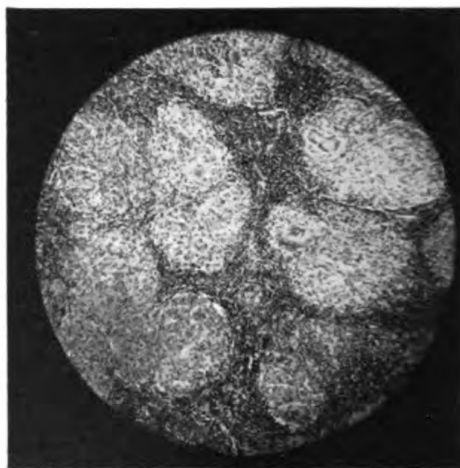


Figure 2.—Biopsy of axillary lymph node from Case 1. Note the large giant cells and the large clusters of large pale epithelial cells and the absence of necrosis or caseation.

Physical examination revealed a well-developed and well-nourished white male of 19 who was in no apparent distress. There were small discrete anterior and posterior cervical nodes, and a large 2 cm. node in the left axilla. The nodes were nontender, firm, freely movable, and not attached to the skin. The blood pressure was 102/58. The abdomen was soft; the spleen was questionably palpable at the left costal margin. Otherwise the physical examination was normal.

On 10 December the sedimentation rate was 14 mm. per hour, the urinalysis showed an occasional granular and hyalin cast, the hemoglobin was 13.0 grams (84 percent), and the white blood count was 4,600 with 25 lymphocytes, 1 eosinophil, 72 segmented polymorphonuclear leukocytes and 2 band forms. A roentgenogram of the chest showed a diffuse nodular fibrosis throughout both midlung fields with relatively clear apices and with hilar lymphadenopathy (fig. 1). Five sputum specimens were negative for acid-fast organisms. Roentgenogram of both hands and feet were normal.

Beginning 23 December a rough friction rub was heard for 4 days on the anterior chest at the level of the fifth left interspace. Repeated blood counts were essentially unchanged. The blood Kahn and skin tests with histoplasmin, tuberculin, and coccidioidin were negative. The total plasma proteins were 6.63 grams with 4.09 grams of albumin and 2.45 grams of globulin. The patient remained afebrile during admission and was asymptomatic except for a slight cough, some dyspnea after strenuous exertion and easy fatigability. A biopsy specimen of the left axillary node was taken on 2 January 1947. The histologic examination showed two lymph nodes which were adherent to each other, the largest of which measured 2.5 by 2.0 cm. The nodes were homogeneous in consistency throughout. The microscopic sections of the lymph node showed a complete replacement of the normal architecture of the node with rounded masses of large pale staining acidophilic epithelial cells arranged in a tuberclelike fashion. Within the center of these tubercle formations there were multiple large giant cells containing many nuclei arranged peripherally. The intervening tissue was composed of lymphocytes with only an occasional germinal center present. There was an early interstitial fibrosis which had involved the hilus and to a lesser extent the capsule. No caseation or necrosis was noted in any area. There was, however, a fibrous replacement. The picture pathologically was that of Boeck's sarcoid of a lymph node (fig. 2).

He was given a course of high voltage roentgen therapy to the chest consisting of 440 tissue roentgens during the period from 4 March 1947 to 28 March 1947, without any appreciable change in the pulmonary infiltration. Because of his complaints of dyspnea on exertion and easy fatigability he was surveyed from the service in July 1947. The patient evidenced pulmonary sarcoidosis with lymphadenopathy without skin manifestations; the rough friction rub heard for 4 days is suggestive of a transient pleural involvement. This patient aptly illustrates the characteristic paucity of signs and symptoms in the face of extensive disease.

Case 2.—J. P. F., a 27-year-old male was admitted to the hospital on 17 April 1947. He was originally admitted to the sick list because of an area of pulmonary infiltration had been noted when the annual physical examination was made in December 1946. At the time of admission to this hospital, he had complained of moderate cough and expectoration and mild fatigability. He gave a history of having contracted filariasis in Samoa in April 1943 with subsequent complete recovery.

Physical examination revealed harsh breath sounds in both lung bases and enlarged lymph nodes in the right axilla and in both inguinal and posterior

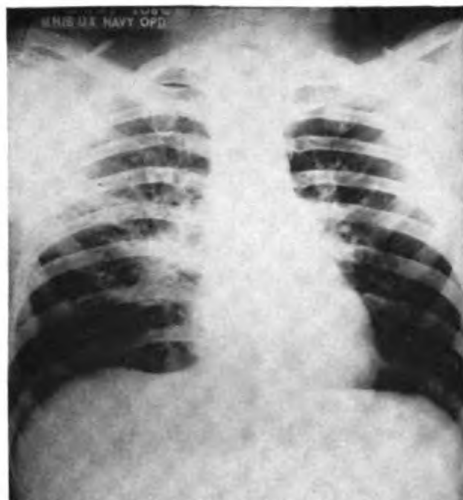


Figure 3.—Case 2. Shows extensive infiltration of both upper lung fields, more marked on the right with bilateral hilar lymphadenopathy.



Figure 4.—Case 2. Biopsy of inguinal lymph node. Note replacement of normal architecture with tuberclelike formation, without necrosis or caseation.

cervical regions. A roentgenogram of the chest taken 17 April 1947 showed an extensive area of infiltration involving both upper lung fields, more marked on the right with bilateral hilar lymphadenopathy (fig. 3). Skin tests with tuberculin, coccidioidin, and histoplasmin were negative. Bronchoscopic examination was negative aside from a moderate amount of mucus in the right lower lobe bronchus. Lipiodol studies were normal. Urinalysis was normal. A complete blood study showed the red blood cell count to be 5,000,000, the packed cell volume was 47.3, the white blood cell count 13,500, the hemoglobin 14 grams, the differential 71 percent polymorphonuclears, 2 percent band forms and 27 percent lymphocytes. The sedimentation rate was 1 mm. in 1 hour. The blood Kahn test was negative. Repeated sputum examinations showed no acid-fast bacilli. Roentgenograms of both hands and feet were negative for any bone changes. A biopsy specimen from a right inguinal lymph node taken on 4 June 1947 showed a lobulated lymph node measuring 2.5 by 1.5 by 1.0 cm. It showed some areas of fresh hemorrhage and two rounded nodular areas at one pole. Microscopic examination of the lymph node showed a massive replacement of the normal lymphoid structures with rounded nodules composed of large pale epithelial cells with vesicular nuclei and acidophilic cytoplasm. Within the centers of these nodules there were multinucleated giant cells with peripherally arranged nuclei. Many of the nodules had undergone almost complete fibrosis, others showed a marked degree of peripheral fibrotic replacement. This fibrotic change involved the interstitial tissue of the node, the hilus, and the capsule. Only a small portion of the normally organized lymphoid tissue remained. The picture was that of Boeck's sarcoid of the lymph node showing fibrous replacement (fig. 4). The total serum proteins were 8.1 grams percent with an albumin to globulin ratio of 2.1 to 1.

He was given a course of high voltage roentgen therapy to the chest during the period from 25 June 1947 to 23 July 1947; 480 tissue roentgen were administered in 12 treatments.

In February 1948 an indurated erythematous slightly raised lesion with annular outline was noticed on his left cheek. A punch biopsy taken that day showed

an irregular acanthosis of the epithelium with interpapillary elastosis of the skin. Deep in the dermis there were several areas of infiltration with cells of pleomorphic character consisting of a rounded nest containing giant cells and surrounding zone of epithelial cells. Adjacent the nests described above there was a small collection of polymorphonuclear leukocytes and an occasional eosinophil. The picture was that of a granulomatous lesion of the skin and in view of the previous history was consistent with a diagnosis of Boeck's sarcoid of the skin.

During his course of hospitalization he became symptom-free and was given 90 days sick leave. There was no change in the pulmonary infiltration following the therapy. On 10 February 1948 he was discharged to limited duty.

This case demonstrates marked pulmonary involvement with intrathoracic and peripheral lymphadenopathy with early cutaneous involvement. In spite of extensive roentgenographic evidence of pulmonary infiltration the patient was relatively symptom-free and returned to limited duty.

Case 3.—D. D. T. an 18-year-old male entered the hospital on 10 June 1947. His main complaints at the time of admission were those of an upper respiratory infection which had been present for 3 weeks and painless swelling in the right supraclavicular region. The patient had had a chronic nonproductive cough for the previous 16 months, and frequent upper respiratory infections for the past year. The physical examination was essentially negative aside from an enlarged lymph node the size of an almond in the right supraclavicular fossa. The node was firm, discrete, and somewhat tender.

Roentgenogram of the chest on 12 June 1947 showed enlarged hilar nodes on the right side with an associated inflammatory infiltration process extending outward from the hilus (fig. 5). The sedimentation rate was 22 mm. in 1 hour. A skin test with tuberculin (protein pure derivation No. 1.) was negative, a skin test with protein pure derivation No. 2 (0.005 mg.) was reported as 3+. A skin test with coccidioidin was negative. Roentgenograms of the bones of both hands and feet showed no bony change. The serum proteins including the albumin and globulin fractions were within normal limits.

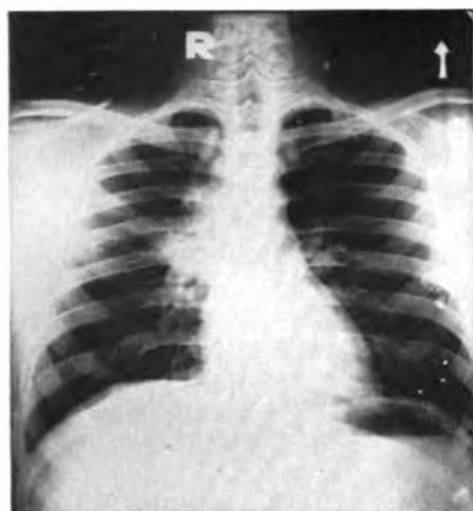


Figure 5.—Case 3. Note the infiltration into right hilar region and right upper lung field with right hilar lymphadenopathy.

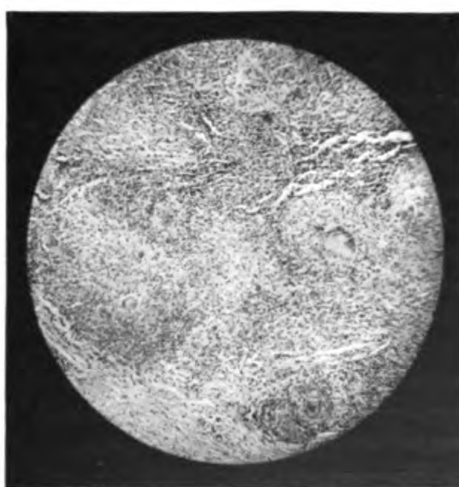


Figure 6.—Case 3. Biopsy of supraclavicular lymph node. Note the tuberclelike formation containing multinucleated giant cells and the interstitial fibrosis.

On 18 June 1947, a biopsy specimen of the right supraclavicular lymph node was taken. The histologic examination showed several fragments of lymphoid tissue embedded in fat. Microscopic examination of this tissue showed that it consisted of subcutaneous adipose tissue in which there were several small lymphoid aggregations. The lymphoid tissue showed a replacement with rounded nodules composed of pale staining acidophilic epithelial cells. In the center of each nodule there were multinucleated giant cells with peripherally arranged nuclei. Many of these nodules had undergone almost complete replacement with fibrous tissue and there was a generalized fibrosis throughout the interstitial tissue, including the adipose tissue. There was no necrosis or caseation. The picture was that of Boeck's sarcoid undergoing fibrosis of a rather marked degree (fig. 6).

The patient remained essentially asymptomatic during his period of hospitalization. He was given high-voltage roentgen therapy to the chest 11 times with a total dosage of 480 tissue roentgens during the period from 30 June 1947 to 25 July 1947, with no appreciable change in the roentgenographic findings.

He was discharged to duty, symptom-free, on 23 August 1947.

This case illustrates Boeck's sarcoid with involvement of the peripheral and hilar lymph nodes with pulmonary infiltration and without any skin or bony lesions.

Case 4.—G. K., a 26-year-old male, was admitted to the hospital on 9 March 1948 with the complaint of painless lumps in tattoo marks on his left forearm, his left arm, his right wrist, right arm, the dorsal surface of his left foot, and on both breasts. The tattoo marks had been performed at various places beginning at Pearl Harbor in 1940 and ending in Seattle in 1947. The swelling originally started in the tattoo marks on his left forearm which was the first tattoo he had received and then occurred in the other tattoo marks in relation to their age. The nodules were scattered diffusely in the tattooed areas but seemed to be more prevalent in the areas in which brown pigment was used. A tattoo on the dorsal surface of the right foot and a tattoo around the navel were the only two tattoo marks which were not involved.

The general physical examination was essentially negative aside from the raised nodular areas in the tattoo marks. Because of the pigment of the tattoo, it was not possible to note the color of the nodular areas. There was no adenopathy noted of any of the peripheral nodes.

Roentgenogram of the chest on 10 March 1948, showed a moderate increase of the right hilar shadow with some areas of increased density extending downward from the hilar region (fig. 7). Roentgenograms of the bones of the hands and feet showed no bony changes. The serum proteins showed a value of 7.2 grams percent with 5.2 percent albumin and 2.0 gram percent globulin. Albumin globulin ratio was 2.6 to 1.

The red and white blood cell counts were normal as was the value for hemoglobin. The urinalysis was normal. A fundoscopic examination was normal. The first strength tuberculin skin test was negative, the second strength (0.005 mg. protein pure derivative) was 2+. A punch biopsy specimen of skin from one of the involved tattoo marks in the area of the left deltoid was taken on 16 March 1948.

The histologic examination showed a round piece of skin measuring 0.7 cm. in thickness. The epidermoid surface showed irregular bluish brown discoloration. On cut section there were small hemorrhages just beneath epidermoid surface. The microscopic section showed a granulomatous lesion beneath the epidermis composed of masses and islands of epithelial cells arranged in the



Figure 7.—Case 4. Note the hilar lymphadenopathy on the right with infiltration extending downward to the right base.



Figure 8.—Case 4. Microscopic section of skin lesion from tattoo mark. Note characteristic arrangement of subepithelial epithelial nodules with giant cells and the absence of necrosis.

characteristic pattern of Boeck's sarcoid. At the edge of the section there was some dark pigment in the tissue which was due to the pigment of the tattoo (fig. 8).

The patient was started on calciferol and during the period 20 March 1948 to May 1948 received 100,000 units daily. From the period of 9 May 1948 to 14 June 1948 he received 50,000 units daily. The total dosage was 6,650,000 units. Under this therapy there was an obvious but not total regression of the skin nodules. In addition the lesions in one tattoo mark on the right wrist were exposed to 375 units of high voltage roentgen therapy, given in 5 doses of 75 units each, with no change in the appearance of the lesions either during or following the roentgen therapy. It was of interest that there was no change in the lesion in this tattoo mark following the calciferol administration.

This case illustrates Boeck's sarcoid with involvement of the skin, right hilar nodes and right lung field, with no apparent involvement of their peripheral nodes.

Case 5.—R. C. A., a 40-year-old dependent woman, was examined by the tumor board at the hospital, on 2 February 1948. She gave a history of having been seen by the tumor board at the U. S. Naval Hospital, Oakland, Calif., on 21 April 1947 because of a lump behind the angle of the jaw on the right side. She had first noticed this mass at the age of 18. The mass was not painful. The past history was essentially negative. The family history revealed that one sister had had tubercular enteritis. Physical examination at that time was essentially negative aside from a mass measuring 2 by 5 cm. behind the posterior border of the right sternomastoid muscle. The mass was freely movable and not attached to the skin. There were two swollen masses below the larger one. The laboratory report was as follows: Red blood cell count 4,540,000; white blood cell count 15,000 with a normal differential count; hemoglobin 13.0 grams (84 percent); urinalysis normal; blood Kahn negative; chest roentgenogram normal. The mass was removed on 22 April 1947. The report was as follows: "There is one large and one small gland, which on histological examination show marked

disturbance of the lymphoid elements with complete disappearance of the germinal centers and replacement by a diffuse sheet of small round lymphocytes. Scattered, discrete, sharply demarcated, granulomatous lesions occur throughout, and these lesions consist of pink staining epithelial cells with large oval-shaped vesicular nuclei. A few giant cells of the multinuclei type are seen. Acid-fast stains are negative for tubercle bacilli. Diagnosis, "early Boeck's sarcoid." The total plasma protein on 15 July 1947 was 6.9 grams percent with 4.2 grams percent of albumin and 2.7 grams percent of globulin. Albumin globulin ratio was 1.5 to 1. Roentgenograms of the hands and feet showed no bony pathologic changes. The blood Kahn test and urinalysis were negative.

On 10 October 1947 it was noticed that the two small nodes previously noted at the right side of the neck had increased in size. These two lymph nodes were removed on 10 October 1947. The pathological report was that of Boeck's sarcoid, involving a lymph node.

On reexamination by the tumor board on 2 February 1948, no further progress of the disease was noted. There were no skin lesions, no noticeable lymphadenopathy and the roentgenograms of the chest, hands, and feet were negative.

This case illustrates Boeck's sarcoid with involvement of the peripheral lymph nodes without other manifestations.

Case 6.—M. C. O., a 35-year-old dependent woman appeared before the tumor board at the hospital, on 22 June 1945 because of a hyperkeratotic lesion in the region of the right temple which had been present for the previous 10 months. She gave a history of having been under treatment with tuberculin, for what was considered to be a tuberculous retinitis of the right eye during the period from 1937 to 1942. In 1942 she had had an ulcerated lesion in the roof of the mouth which was treated with silver nitrate and which subsequently healed.



Figure 9.—Case 6. Note the collection of nodules immediately beneath the epidermis composed of epithelial cells with an occasional giant cell. There is no caseation or necrosis.

On 22 June 1945 the hyperkeratotic lesion in the right temple was removed. The appearance on histologic examination was that of Boeck's sarcoid (fig. 9). Roentgenogram of the chest at that time showed a slight prominence of the right upper border of the mediastinum opposite the aortic knot, which suggested possible hilar glandular enlargement.

This case illustrates Boeck's sarcoid of the skin with suggestive involvement of the hilar lymph nodes, and a history of an old retinitis which on retrospect was probably due to sarcoid infiltration.

SUMMARY

1. A brief review of the literature dealing with Boeck's sarcoid has been given.
2. Six cases which have occurred at a U. S. naval hospital have been presented.

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Experiences With the Marrow Nail Operation According to the Principles of Kuentscher^{1 2}

PART I¹

PROF. DR. C. HAEBLER

IN MY previous publication on the marrow nail operation the final findings were not evaluated statistically because the material in question appeared to be too small. The experience obtained from 900 cases does not say a great deal, nevertheless a preliminary evaluation seems to be useful.

The problems to be dealt with are whether the results obtained by marrow nail operations for treating bone fractures are superior to other methods and whether or not the number of disadvantageous effects are so great that they offset the better results.

The healing of a fracture is usually determined by the formation of callus as observed in the roentgenogram. However these roentgenograms may be deceptive. From the clinical point of view a fracture may be solid and suitable for weight-bearing although a sufficient formation of callus is not shown. Conversely, an abundant formation of callus (without structure of lines of force) may not withstand the strain caused by exercise even while the patient is still confined to his bed. From the foregoing observations it was concluded that besides the estimate obtained on physical examination the best crite-

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² Experiences gathered during the author's activities as consulting surgeon of the Air Armada "Reich"; at the Air Force hospital at Braunschweig (Stabsarzt von Scanzoni); and at the Municipal Hospital, Ricklingen/Hanover.

³ Part II of this article will be published in the July-August issue of the NAVAL MEDICAL BULLETIN.

rion is the subjective statement of the patient as to pain noted on weight bearing, or during bending, or pressing together the fragments.

In case of a true stabile osteosynthesis painless weight bearing is possible at a time when a sufficient formation of callus is not yet observed. In such a case, even roentgenograms are of no help. It is well known that in case of an ideally fixed fracture the formation of callus is particularly slight and it is restricted to the fracture cleft. In case of an inserted nail the dense shadow of that nail covers the callus to a great extent. But if a sufficient quantity of callus has been formed the shadow of the nail will render it difficult, sometimes impossible, to determine its structure of the lines of force or its stability.

Figure 1 shows a nailed pseudarthrosis of the arm above the elbow in which only the connective tissue cartilage was removed from the fracture planes. A resection was not made because the radial nerve was lying in the newly formed joint capsule. So much of the fibrous cartilage was removed that the bleeding bone was exposed. The patient, a sergeant, served in the field army for more than 2 years with the nail in place. From the clinical point of view the fracture was absolutely stabile. From the roentgenological point of view sufficient callus had formed. Slight rarefactions may be observed about the nail point. (The wires were applied during a previous unsuccessful operation.) After the removal of the nail the pseudarthrosis again was evident.

According to experience gathered with the foreign body osteosynthesis it was hoped that the presence of the metallic nail would stimulate or favor the formation of callus but unfortunately all such hopes were futile. On the contrary it was observed that an abundant formation of "stimulated" callus which is caused by rust or other unfavorable conditions is of little value and may even be disadvantageous. Therefore it must be kept in mind that the marrow nail will further the healing process and the formation of callus only in case of favorable mechanical conditions.

There is no sure symptom to indicate whether and when the nailed fracture is healed and because of this the nail may be removed too early (Boehler). On the other hand we often have left the nail in the bone longer than was necessary. As to the practical evaluation of the method it seems to be without significance, whether bony healing occurs early or late. As soon as the patient can use the broken limb without difficulty, it does not make any difference whether the roentgenogram shows only a little or abundant callus or whether the healing lasts 8 days or 8 months. We know that in all fractures even after

apparent clinical healing, processes of reduction and reconstruction take place which may last years. All this is of utmost importance and of great interest from the scientific point of view but nobody will refer to it when evaluating this new method. Therefore in the statistics in question we take as a basis only the duration of the treatment and the incapacity for work.

The object of this method was described by Kuentscher as a stabile osteosynthesis by which (just as in the nailing of the fracture of the neck of the femur) the fracture pieces are united by the nail in such a way that any displacement is made impossible and painless weight bearing and use of the limb in question is possible. The mechanical peculiarity of the "lashing" (stabile fixation) obtained with the nail allows a firm pressing together of the fragments during the weight bearing. In this way favorable mechanical conditions for stabilization and for the formation of callus are obtained.

Unfortunately all fractures are not suitable for the marrow nail operation in the sense of obtaining stabile osteosynthesis. An appreciation of the mechanical conditions necessary for marrow nail operation and for healing of the fracture and experience are the only means of determination.

In the beginning only a relatively stabile osteosynthesis was obtained in some fractures (especially of the leg) that were nailed. In many cases absolute stabilization could not be achieved, not only because of the relative unsuitability of the fracture but principally because of the technique used (the nail was either too short or too thin).

It is my impression however, that a relatively stabile osteosynthesis has some advantages and therefore nailing operations of that kind were made intentionally in order to gather further experience.

FRESH SIMPLE FRACTURE

It is of fundamental importance in the marrow nail operation, that the fracture cleft not be exposed in order to eliminate the dangers arising from the open treatment of fractures, such as infections and delayed formation of callus. In fresh fractures such a "closed marrow nailing" should always be possible and the author has always been



Figure 1.—True pseudarthrosis of the arm above the elbow 2¾ years after nailing.

successful. The difficulties may be very great, however, especially if the surgeon is not experienced and he therefore decides to expose the fracture site after the insertion of the nail.

Previously the interposition of soft parts was frequently considered to be an insurmountable obstacle for reduction and therefore the fracture site was exposed. Boehler, however, has pointed out that that obstacle had to be overcome occasionally. He is of the opinion that in case of a dislocation of the fragments soft parts enter the fracture cleft, but if the pressure is strong enough the bone ends come into opposition and the interposition disappears. This observation is confirmed by my own experience. Muscle or fascia interposed between the bone ends is torn by the nail and after that they slip back.

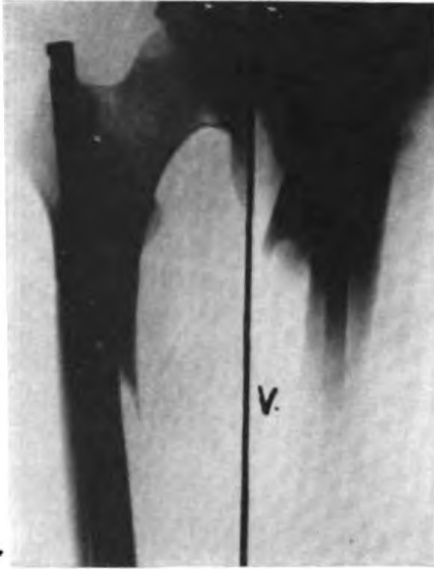
The danger of infection is considerably increased by exposure of the fracture site. We therefore suggest stopping the operation when soft tissues interfere with nailing. In such cases the patient should be treated with wire extension. (After the shortening has been eliminated it will be possible to try a second nailing operation later.) The only indication for the exposure of the fracture is the suspicion that nerves or larger vessels may be involved, but it must be kept in mind that this suspicion has always been an indication for the exposure of the fracture.

A total of 463 cases of nailing operations of fresh simple fractures were performed, 171 of which were for fractures of the legs, 141 for fractures of the arm above the elbow, 133 for thigh fractures, and 18 for fractures of one or both bones of the forearm. Five deaths occurred in the cases of thigh fractures. They will be discussed in detail later in this article.

First I would like to discuss the duration of the treatment and the results achieved.

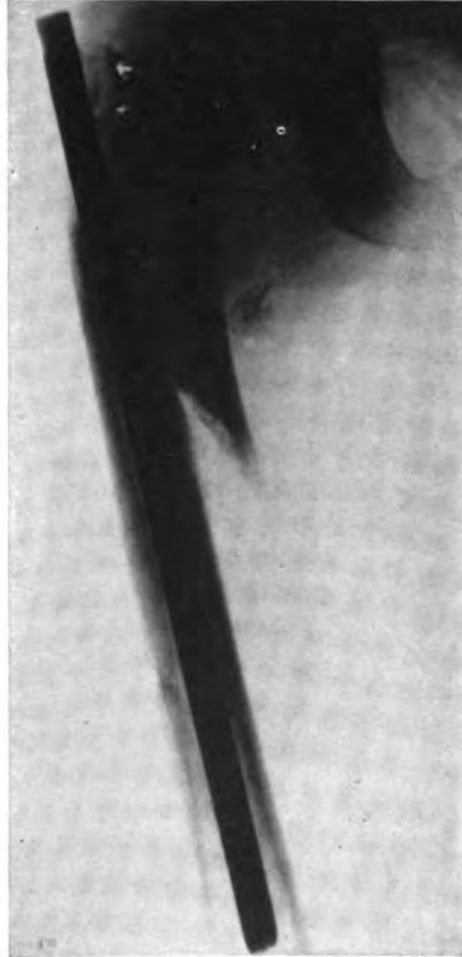
THIGH FRACTURES

It was possible to study the course of 118 of a total of 133 femur fractures until healing occurred. In 111 or 94 percent of the cases, there was good healing without any shortening, bending, or involvement of the joints. (See table 1.) In a 58-year-old patient suffering from arthritis deformans of the knee joint, a limitation of flexion amounting to 20° could not be avoided (table 2). In a single case the shortening amounted to 3 centimeters. In another case an angulation of 30° occurred. This patient was seen sometime after the operation, when the nail was to be removed. He had a transverse fracture in the central third and the osteosynthesis was stable. The distortion was probably not observed during the operation (it was the first case of a nailing of the thigh by that surgeon). This case was treated by

*Figure 2.*

transceting the bone above the fracture with the nail in place; a guide rod was then inserted into the nail, the distortion eliminated and the nail introduced again. The final result was that the limb could be used satisfactorily.

The two other shortenings of 3 and 2 centimeters also could have been avoided. In both cases the osteosynthesis was only relatively stable. The first case had a subtrochanteric transverse fracture which had been nailed by exposing the broken ends because it was not possible to fix the bone ends correctly. After the insertion of the nail the bone ends were firmly pressed together. Roentgenograms after the nailing revealed that "the nail was lying in the marrow cavity, the tip of the proximal fragment, however, pointed to the front." These findings were noted on the lateral roentgenogram (subtrochanteric oblique fracture) after nailing (fig. 2). In the probimal fragment the nail was not lying in the bone axis. After a lapse of only 12 days, when the patient was still confined to bed the limb was subjected to active exercises. On doing so the patient did not complain of pain and 4 weeks later he was able to get up. Two weeks later he complained of pain when walking and a distinct limp was observed. Roentgenogram (fig. 3) showed that the bone ends had slipped. The smooth trabeculas of the spongiosa reacted to the constant rhythmic strain by an absorption and thus the nail moved in

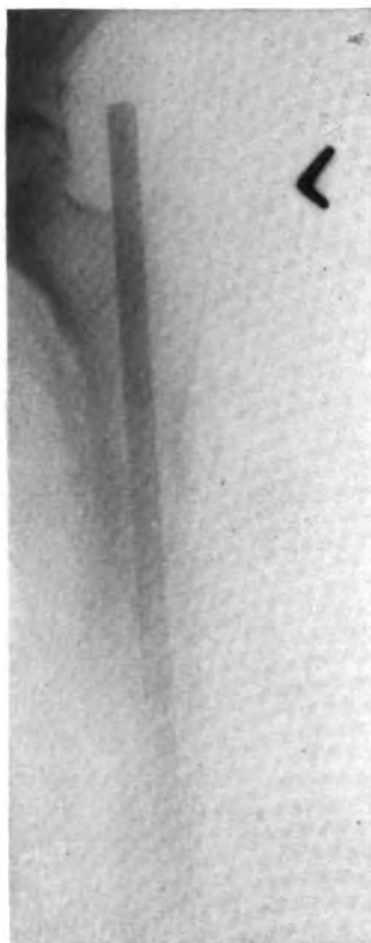
*Figure 3.*

*Figure 4.**Figure 5.*

an outward direction. The old nail bed in the trochanter could be seen. The final result (fig. 4, taken 17 weeks after removal of nail) was a shortening of 3 centimeters. The bed of the dislocated nail

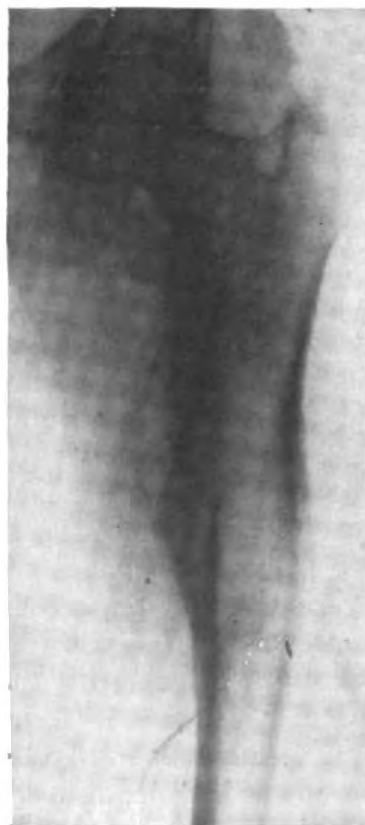
is still visible in the trochanter.

Shortening will not occur in any case in which the nail is inserted in the proper axial direction, if the fragments are not pressed together, and if the bone is not subjected to weight bearing too early. A 68-year-old woman suffered a pertrochanteric spiral fracture with a separation of the lesser trochanter. Roentgenogram (fig. 5) was taken 5 days after the injury. After nailing the fracture was in very good position. The separated piece with the lesser trochanter was in good position (fig. 6). The patient was able to walk 2 weeks later. Under the influence of weight bearing the fragments were firmly pressed together causing a shortening of 1 centimeter; the nail had slipped out of the trochanter above, because it jammed in the marrow cavity of the distal fragment (fig. 7). The nail had been inserted medial to the trochanter and not through it, therefore a lateral displacement or curvature was avoided. The patient was able to leave the hospital 32 days after the operation and to do all kinds of house-

*Figure 6.**Figure 7.*

work. The nail was extracted 5 months after the operation. Four months after the removal of the nail (fig. 8) the fracture showed healing in perfect position. The nail bed was not visible. A small amount of callus was observed at the upper part of the trochanter. All joints were freely movable and free of pain.

We cannot agree with Boehler that spiral fractures in the upper third should not be nailed, but treated with the wire extension "because they cannot be kept in place by the nail alone." Figure 9 shows a subtrochanteric spiral fracture with separated third fragment 22 weeks after nailing. No shortening was noted and

*Figure 8.*

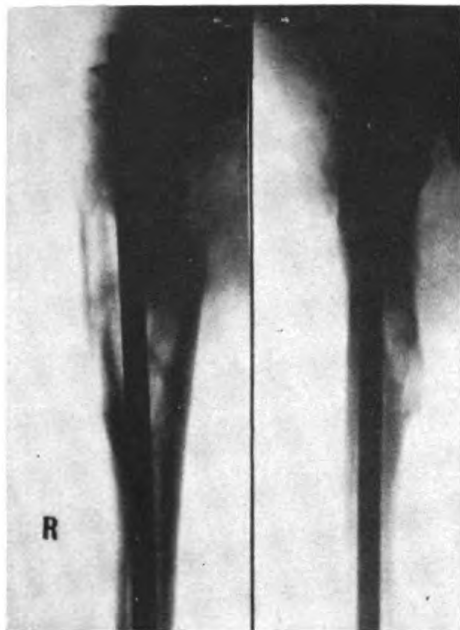


Figure 9.

all joints were freely movable. The patient was confined to bed for 5 weeks, after which the limb was subjected to weight bearing. The patient was released from the hospital 9½ weeks after the operation, fit for service.

The only thing to be taken into consideration is that the fracture must not bear weight too early and that in fractures in the distal areas the nail must be inserted medially to the greater trochanter. Only in this way can it get sufficient hold and so cannot work its way out of the bone laterally.

The shortening of 2 centimeters in a spiral fracture in the central shaft which showed a long splinter broken off (fig. 10) was caused by the insertion of the nail into the distal fragment and in this way the bone ends were pressed together. This condition was not observed in the roentgenogram taken after the operation because of the good general condition of the fracture. A further shortening of the limb did not occur because it was not subjected to weight bearing for 7 weeks after the operation. In fractures of this kind the fragments must not be pressed together. It may be necessary to diminish the counterpressure during the insertion of the nail so the nail may push that fragment into its former position.

It seems unnecessary to use additional wire extension or nail extension as is recommended by Boehler in cases of fractures with long spiral splinters or in cases of double fracture. In applying Boehler's principles we would lose the advantage of the marrow nail operation.

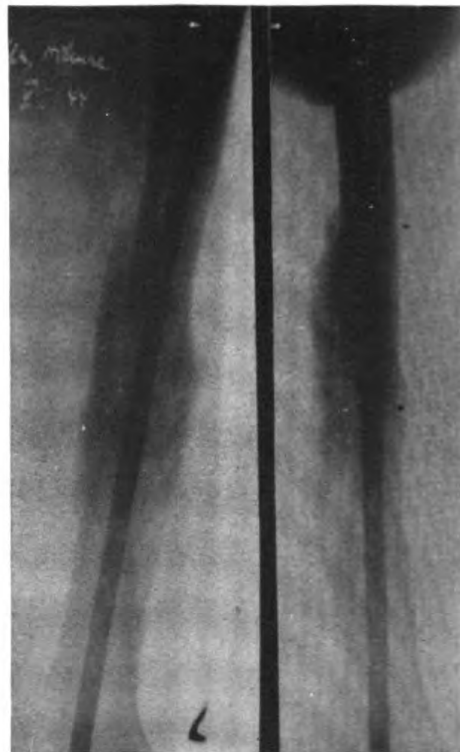


Figure 10.—Healed long spiral fracture in the middle of the shaft with a separated spiral splinter.

It is only necessary to use nails which are long enough and which are driven into the spongiosa of the distal epiphysis. It must be remembered that this osteosynthesis is only "relatively stabile."

In the beginning the nail finds sufficient hold in the spongiosa of the knee joint epiphysis so that the joint may be moved or bear weight. Under the strain of rhythmic weight bearing the spongiosa spicules are quickly absorbed (4 to 6 weeks) and small chips may break off the ends of the fragments. When this occurs the nail loses its hold and the bone shortens or bends because the fracture callus is not yet strong enough. Its value is decreased by the constant bending and a resorption in the vicinity of the fracture cleft or a fracture of the nail may occur. Figure 11 is an illustration of a fracture of the callus and nail which occurred 10 weeks after the operation because the patient carried heavy loads. The osteosynthesis was not stabile because the nail was not inserted medially to the trochanter but through it and the



Figure 11.

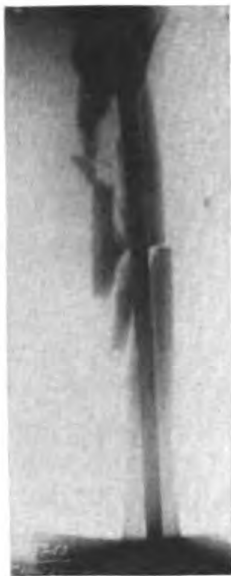


Figure 12.



Figure 13.

nail head was lying in the bone. Instead of removing the nail immediately and counteracting the curvature, a plaster cast was applied for a period of 6 weeks and the fracture healed again.

When the patient complains of pains, in those cases in which their fractures were subjected to painless weight bearing previously, there is danger of displacement. Special attention must be attached

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to this fact and such a patient must be confined to bed again and repeated roentgenograms must be taken to observe any alteration in contour. Any bending that occurs must be counteracted and an additional cast is required. Shortenings must be corrected, under anesthesia, by means of extension and after that a wire extension must be applied. If a shortening or a bending does not exist or if movements without weight bearing are painful, Buck's traction will suffice. Therefore special attention must be given to those cases. By doing so, even serious comminuted fractures may heal in good position without having to use a wire extension from the very beginning. Figure 12 illustrates a comminuted femur fracture after nailing. The nail jammed in the marrow cavity of the distal fragment and the osteosynthesis was stable. The limb was subjected to active exercise 6 days later during confinement to bed and 6 weeks later was subjected to weight bearing. Figure 13 was taken 17 weeks after the operation and after the removal of the nail. All joints were freely movable and there was no shortening.

Distally located spiral fractures are no longer nailed because in two cases wire extension was required in addition to the nail. In those fractures nailing is not indicated. If the right technique is applied, fractures will heal well with wire extension alone.

Table 1 demonstrates the exact data of the treatment.

TABLE 1.—*Time required for treatment and results with marrow nailing of fresh simple femur fractures*

Hospital	Number of cases	Average number of days of hospitalization	Average days unfit for service	Final results		
				I ¹	II ²	III ³
Military.....	71	145	198	66	3	2
Civilian.....	47	55	109	44	2	.....
Total.....	118	108	162	111	5	2

¹ Healed without shortening, curvature, or impediment of the joints.

² Slight curvature, shortening, or impediment of the joints (decrease of ability to earn a living, less than 20 percent).

³ Marked shortening, curvature, or impediment of the joints (decrease of ability to earn a living, 20 to 50 percent).

⁴ 94 percent.

⁵ 4.3 percent.

⁶ 1.7 percent.

Patients remained for a longer period in military hospitals than in civilian hospitals. This was due primarily to the fact that the military patients were in 11 hospitals and several of the surgeons who had performed only two or three nailings desired to keep their patients under observation as long as possible; while patients treated in civilian hospitals could be observed after their release from the hospital and thus it was possible to permit them to resume their work earlier.

Our data nearly corresponds to those of Fischer and Maatz (length of time required for the treatment in the hospital, 58 days; unfitness for work, 170 days).

In table 2 we see the results obtained by Boehler (conservative treatment).

TABLE 2.—*Duration of treatment and results obtained in cases of conservative treatment of fresh simple femur fractures (according to Boehler)*

	Average time of treat- ment, days	Working days missed	Permanent annuities based on percentage of disability
Treated in emergency hospitals.....	240	627	10.2
Treated in other than emergency hospitals.....	390	1,819	21.6

The fractures treated by Boehler included distally located fractures, which we did not nail. However, the longest period of medical attendance in marrow nailings is no longer than the average duration of treatment in an emergency hospital. The longest period of incapacity was one-third of that with the conservative treatment in Boehler's clinic (which is one of the best).

Another advantage of the marrow nail method is that it is much easier to care for the patient. The fact that a day or two after the operation the patient is free from pain and in a short time is able to move the limb and subject it to weight bearing relieves the patient from mental and physical strain. Many of our patients were employed at strenuous work sometimes as early as 5 to 7 weeks later. This may be done even though the fracture has not yet come to bony healing because the very strong femur nail provides sufficient support in all suitable fractures. The patient must, however, be kept under constant observation, for even in fresh fractures the marrow nail may break. If in such a case the patient consults a physician not acquainted with this method, such a physician may fail to extract the nail immediately and replace it with a new nail.

A 20-year-old parachutist after a jump suffered a simple transverse fracture in the middle of the femur. This was immediately nailed. Ten days later he was able to get up without having pain and was released from the hospital 8 weeks later. Eleven days later, while carrying a heavy sack, he experienced pain at the fracture site. Despite this fact he continued walking thus causing a bend at the fracture site. He was sent to a military hospital where a plaster cast was applied for a period of 6 weeks. After that he was transferred to a special department of the hospital in order to have the nail removed. (December 1944.) The fracture had healed in a slight varus posi-

tion. An extraction hook long enough to push forward to the end of the nail tip was not available. The bending, however, was not so pronounced that an osteotomy with another nailing was indicated. therefore only the upper part of the nail was removed and the patient was released from the hospital (because of the conditions of war).

Late curvature or shortening in cases of thigh fractures—except the above-mentioned case—was not observed after release from the hospital. Most of our nailing operations (98) were stable and only in those cases were the patients granted an early release from the hospital.

Fractures less than 7 centimeters from the knee joint were not nailed in our hospital. Operations of this kind were tried three times in military hospitals but in all cases great difficulties were encountered. Two of the patients died and we declined to perform the nailing operation in the third case. This patient was treated with a wire extension and good healing resulted.

Fractures of that kind and spiral fractures in the lower third with a long spiral splinter are considered unsuitable for the marrow nail operation. Physicians not well acquainted with the technique of the wire extension and who are not able to bring the fracture into a good position by this extension will not be able to perform a nailing operation without an exposure of the fracture site. Even if this process can be carried through successfully an additional wire extension is required and therefore the advantage obtained is not so great.

If by applying a wire extension satisfactory results cannot be obtained and the fracture site must be exposed, the fracture pieces should be united by putting a wire around them (in spiral fractures) or by applying a Lane's plate (in transverse fractures). This will give better results than the marrow nail. The nail can never find sufficient hold in the distal fragment and the protection against displacement is less than by an osteosynthesis with wire or plate. If an infection occurs, however, the nail will cause an infection of the entire marrow cavity and of the knee joint which may lead to death or to the loss of the affected limb.

LEG FRACTURES

Healing was obtained in 162 out of 171 cases of nailed leg fractures and the results obtained are shown in table 3.

In all these cases we had to deal with slight valgus positions or slight recurvations without impairment of the joints or else slight shortenings of less than 1 centimeter.

On the other hand it must be taken into consideration that the material published by Boehler was gathered in a clinic which is well known for its great experience and good results obtained.

TABLE 3.—*Duration of treatment and results obtained by marrow nailing operation of fresh simple leg fractures*

	Number of cases	Average number of days in hospital	Average number of days of service disability	Final result		
				I ¹	II ²	III ³
Military hospital	97	122	141	86	10	1
Civilian hospital	65	67	131	63	2	.....
Total	162	102	133	⁴ 149	⁵ 12	⁶ 1

¹ Healing without any shortening, curvature, or impediment of the joints.

² Slight curvature, shortening, or impediment of the joint (less than 10 percent).

³ Marked shortening, curvature, or impediment of the joints (20 to 50 percent).

⁴ 92 percent.

⁵ 7.4 percent.

⁶ 0.6 percent.

Our own two unsatisfactory cases occurred in our early experience, when the marrow nail was still inserted lateral to the tibial tuberosity. In this way a recurvation is avoided, but in oblique fractures a slight valgus position may occur especially in case of an early weight-bearing.

In comparison to these two cases the case demonstrated by figure 14 must be considered a bad result. This was not due to the method but to the technique used. In this case only one nail (the thin nail) was applied (which in addition was too short for such a distally located fracture), and the valgus position was not corrected. Therefore the osteosynthesis was only relatively stabile and the valgus position

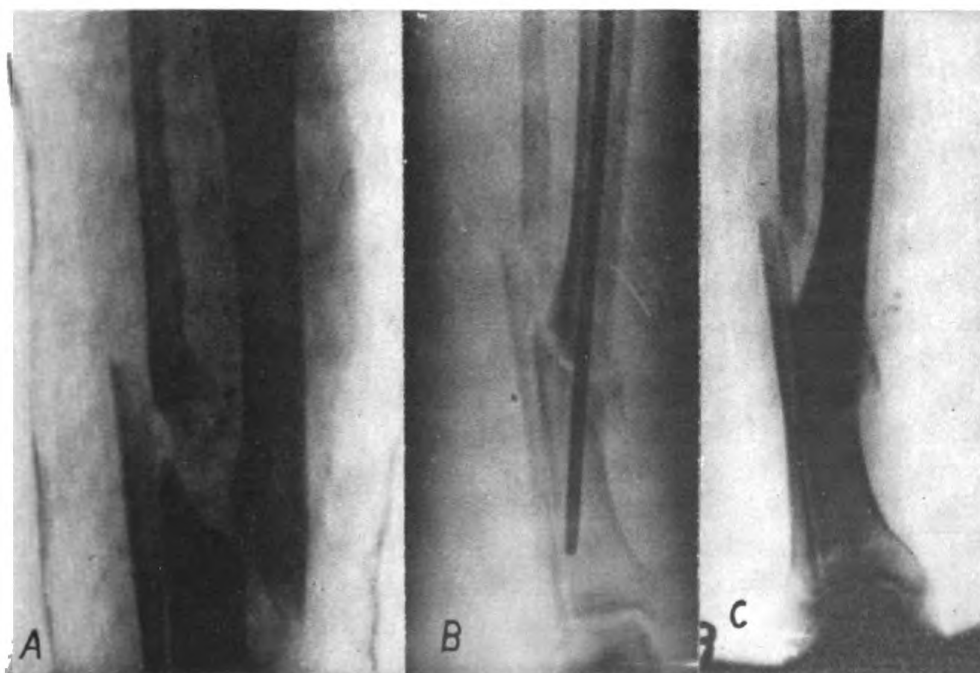


Figure 14.

increased later on. An infection occurred at the point of insertion of the nail and at the fracture cleft, and for this reason an additional plaster cast was applied. The bone was subjected to weight bearing after a good formation of callus. A study of the roentgenogram with the plaster cast before the nailing, should have decided the physician not to nail this fracture.

For comparable purposes figure 15 shows a similar fracture. In this case a long double nail was applied and healing in perfect position achieved.

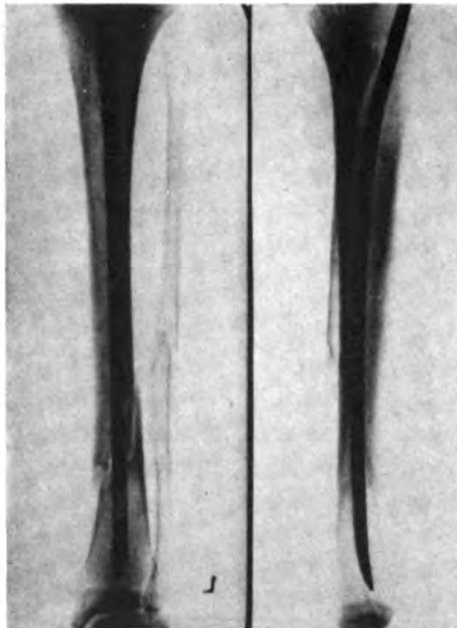


Figure 15a.—Simple oblique fracture of the leg after a technically correct nailing with a long double nail.



Figure 15b.—Four months after the operation with nail removed. Unfitness for service, 74 days.

With one exception (slight recurvation which was not corrected) the osteosynthesis was only relatively stabile in all cases which did not show satisfactory results. Considering the shape of the marrow cavity of the tibia and the necessity of using only curved nails, very few cases may be considered as "suitable" when bearing in mind that a stabile osteosynthesis should be obtained by the double nail (transverse fractures located at least 8 centimeters from the upper and 10 centimeters from the lower ends of the tibia, or oblique fractures and spiral fractures in the central third). Kuentscher and Maatz have constructed double nails which spread in the distal end of the tibia and thereby also obtain sufficient hold in distally located spiral fractures and in simple fractures (turn-spread nails, nails with an inclined plane). One disadvantage, however, must be taken into consideration: A special nail is required for each fracture and sufficient quan-

tities of nails were not available. Due to this fact very little experience was gathered with these nails and so we are not in a position to give an evaluation of these special types of nails.

In case of distally located spiral fractures and oblique fractures, best results are obtained with the simple double nail. The first condition is that the nails are long enough so that they may find sufficient hold in the spongiosa of the distal fragment. It must be taken into consideration, however, that the osteosynthesis is only relatively stabile and that early weight bearing is not indicated. If necessary a plaster cast or a U-splint must be applied as additional protection for the fracture.

In 16 cases of leg fractures, with a relatively stabile osteosynthesis, which were treated in my civilian practice the period of stay in the hospital was from 23 to 183 days or an average of 77 days, and the inability for work from 68 to 196 days, an average of 134 days. When considering those figures it must be said that a considerable gain is obtained in comparison to the treatment with other methods.

As in all cases of bone fractures the nailing of distally located or complicated leg fractures required technical understanding and skill. From the technical point of view the nailing of leg fractures is very simple. It is perhaps the simplest nailing operation possible. However, the physician must take into consideration the incidents which may occur in order to avoid failures.

In cases of proximally located fractures the nail may slip behind the distal fragment if it is inserted too steeply and too distally (fig. 16). In such a case the fracture must be brought into an anti-curved position. Contrary to this, the nail tip may slip behind the distal fragment in distally located fractures, if an anticurvation exists. In such a case a re-curvation may be successful. In conformity with the "categoric imperative of the fracture treatment" it may be said: "The distal fragment must be brought into that direction in which the nail tip points."

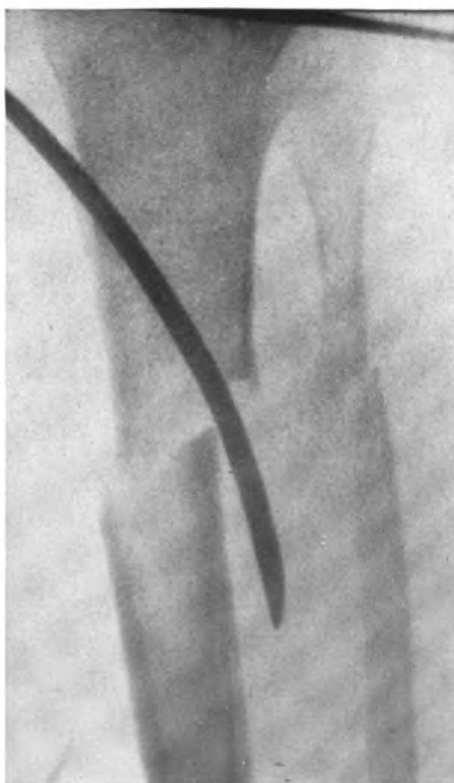


Figure 16.

In one case the nail jammed in the cortex of the distal fragment so much that it was impossible either to drive it in completely or to extract it. The surgeon reacted in the right way. He pinched off the nail and applied a plaster cast until healing occurred. After that the nail could be removed easily.

Only in rare cases of leg fractures will difficulties arise during the operation. They must, however, be expected during the after-treatment, because in leg fractures the osteosynthesis can never be as stabile as in femur fractures.

A transverse fracture (fig. 17a) after nailing; the fragment which had rotated 180° was expected to slip back so that it would not further endanger the skin. Due to a slight valgus position which intentionally was not corrected, necrosis occurred 4 days later, therefore the fragment which was not covered by periosteum was removed. After that a plaster cast was applied, because the osteosynthesis was only relatively stabile. The valgus position was not corrected although this could have been done easily. Figure 17b shows the defect well bridged over with callus 3½ months later. Four weeks after nailing, the patient subjected the leg to weight bearing in an ambulatory cast.

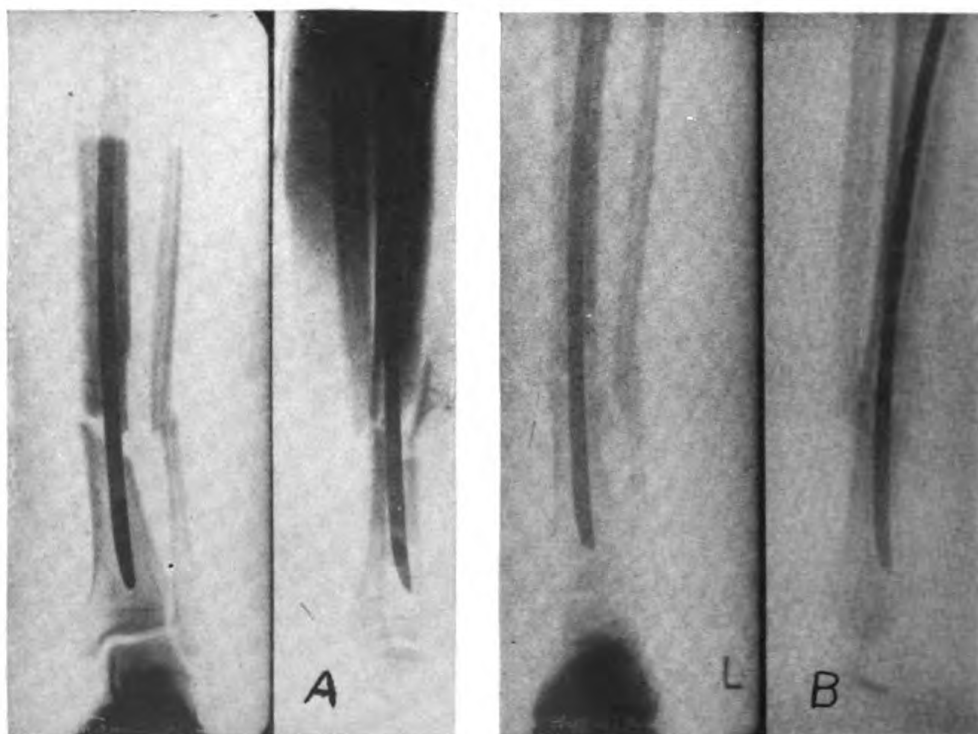


Figure 17.

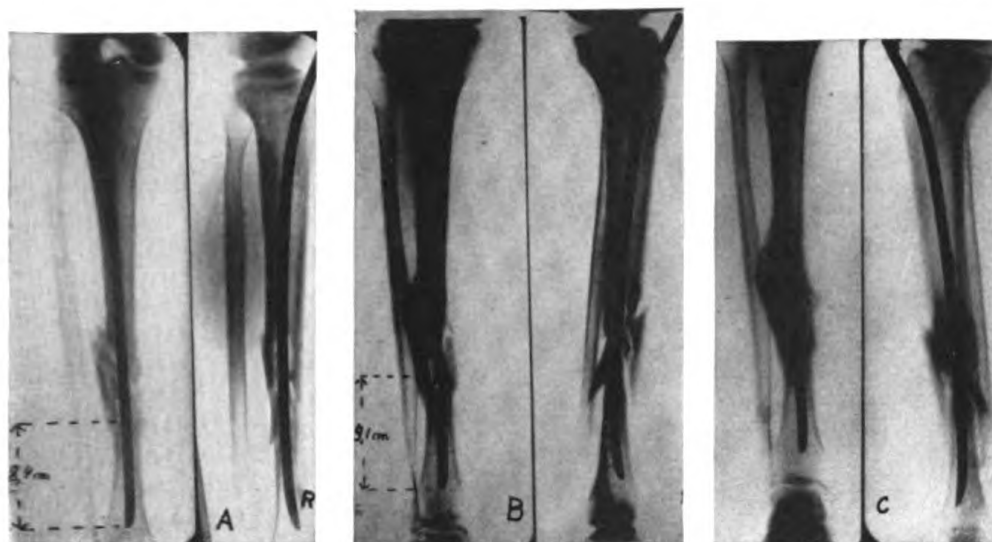


Figure 18.

In the case of the comminuted fracture demonstrated by figure 18a the fracture was absolutely stabile after the nailing. A U-splint was applied and the fracture was subjected to weight bearing 2 weeks later. Although the patient complained about pains at the fracture site, weight bearing was continued. Eight days later the patient complained of pains in the knee joint and therefore a roentgenogram (fig. 18b) was taken in order to determine whether the already very far protracting nail had worked its way out of this fragment. Unfortunately it was not observed that a shortening had occurred. The final result (fig. 18c) was a shortening of three-fourths of a centimeter. The nail had moved into the spongiosa of the distal fragment because it had jammed in the cortex of the proximal fragment. From the beginning it would have been better in this case to drive the nail in deeper and to subject the limb to weight bearing only after some time and then only with a plaster cast. The pains complained of during the process of weight bearing should have been a warning signal.

In case of a proximally located fracture the nail moves in the upward direction during the compression process and may cause trouble as demonstrated by figure 19. This patient suffered an oblique fracture in the upper third of the leg. The position was good after nailing and the fracture cleft was gaping. Ten days after nailing, the limb was subjected to weight bearing and shortly after that the patient complained of pains when bending the knee joint. Eight weeks later, due to the effects of weight bearing, the fragments were firmly

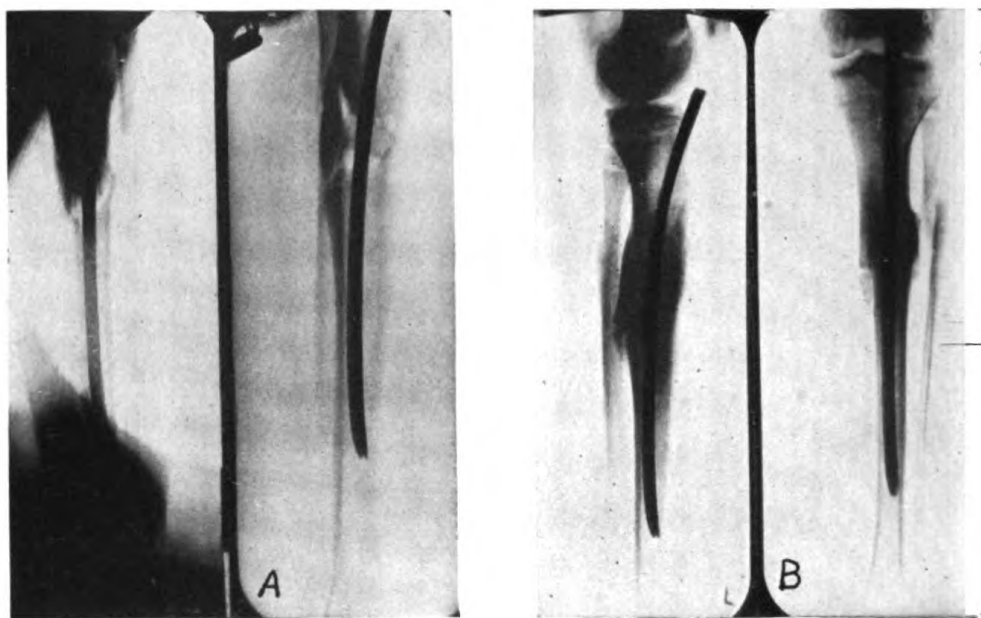


Figure 19.

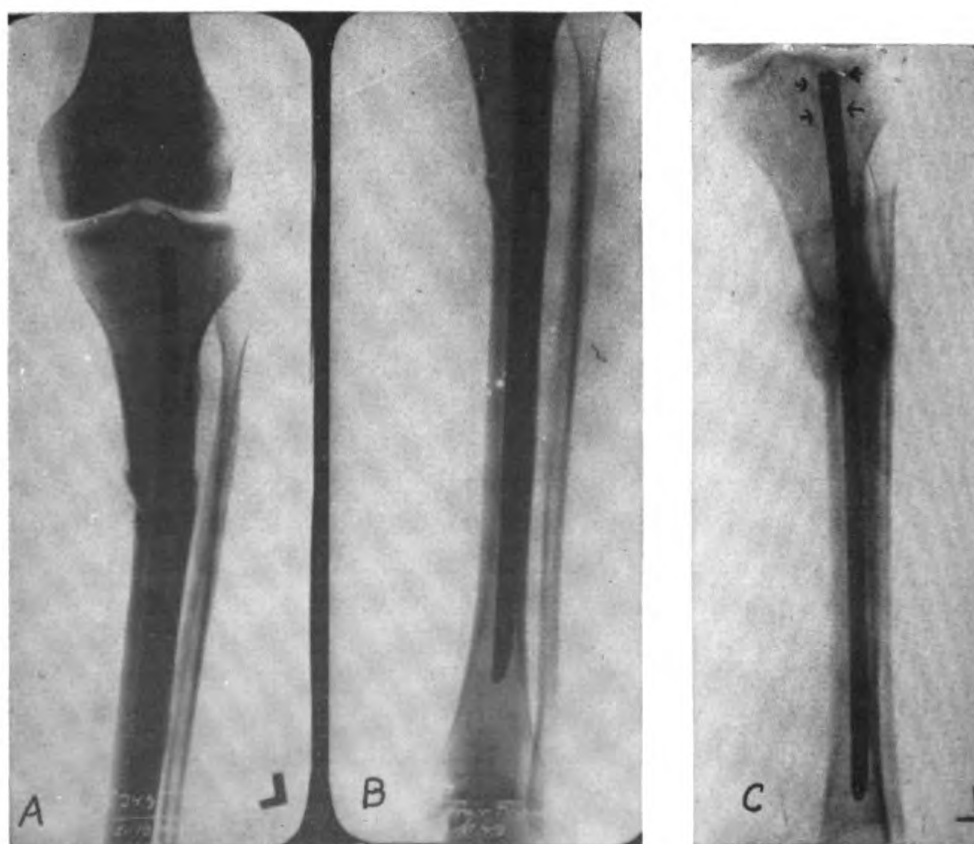


Figure 20.

pressed together (fig. 19b). The nail which had jammed in the distal marrow cavity had moved in the upward direction.

If in proximally located fractures the fibula is intact the compression will be hindered and in transverse fractures a bending may occur if the fracture is subjected to early weight bearing (figs. 20a and 20b). The smooth bone spicules of the spongiosa and the very thin cortex cannot stand the constant slight pressure. They are resorbed and the nail begins to "wander." This may be readily detected by the rarefactions in the vicinity of the nail head end (fig. 20c).

In cases in which the osteosynthesis seems to be stabile in the beginning and the fracture subjected to weight bearing without difficulties, nails which are too short may cause a blocking of the freshly healed fibula and in this way may lead to disturbances of the formation of callus.

Despite the fact that in a transverse leg fracture near the junction of the middle and distal third the nails were too short and the fracture was not compressed (fig. 21a) the patient was given permission to rise after a lapse of 2 weeks. "He had, however, to use crutches in order to determine the extent to which the fracture could be subjected to weight bearing." Eight days later a roentgenogram showed that lateral displacement of the fragments had occurred. Six weeks

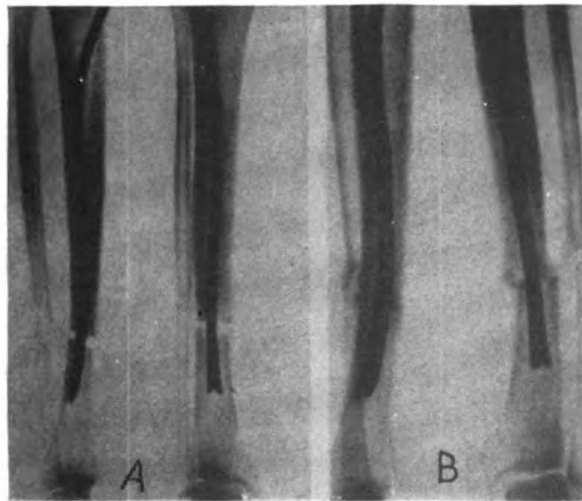


Figure 21a and b.

later the patient could walk without support and therefore was released from the hospital to do garrison duty. In the roentgenogram a good formation of callus was observed in the fibula and tibia, the slight valgus position, however, was not noticed (fig. 21b). Three months later he was sent back to the hospital because of increasing pains at the fracture site and edema of the leg. A roentgenogram

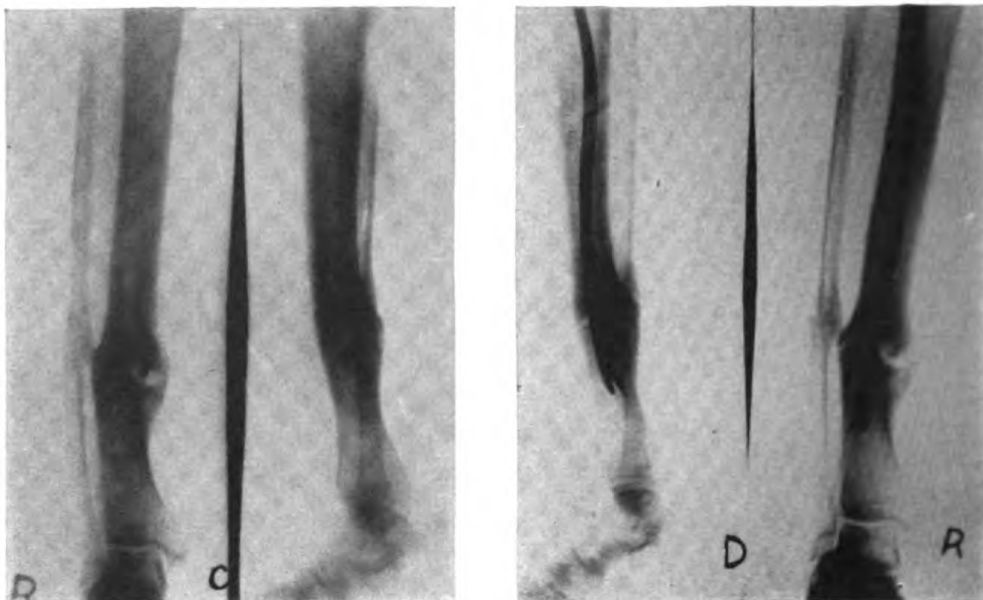


Figure 21c and d.

showed a healed fibula and some callus formation on the tibia, with formation of flanges and the fracture slot remained open. Clinically a distinct springiness of the bones was observed; an unhealed fracture. In the vicinity of the nail tip a rarefaction of the bones was observed which proved that the nails were not at rest. The nails were removed and the fibula separated obliquely. Multiple drilling according to the Beck principle was done; care was taken that the Beck's wire did not cut itself free or get too warm. A plaster cast was then applied. There was a serosanguineous discharge from the drill hole for 14 days, but there was no serious infection (fig. 21c). There was bony healing 3 months later, after an ambulatory cast had been applied (fig. 21d). The removal of the nail and drilling was unnecessary, the latter increased the danger of infection. If in this case a piece of bone 2 centimeters long had been resected from the fibula and the valgus position had been corrected, the patient would have recovered more rapidly.

In the case of an early healed fibula and delayed formation of callus the physician should not hesitate to resect the fibula (not just separate it) and to apply a plaster cast. In this case the nails are kept in place. Even if they are too short they grant an additional support and the fracture will soon come to a bony healing. Figure 22a illustrates a fracture of the leg and both ankle bones. It was impossible to get the fragments into the proper position because of the fractured ankle bones. It was decided to nail the fracture, using the open method. A plaster cast was applied after primary healing and 14

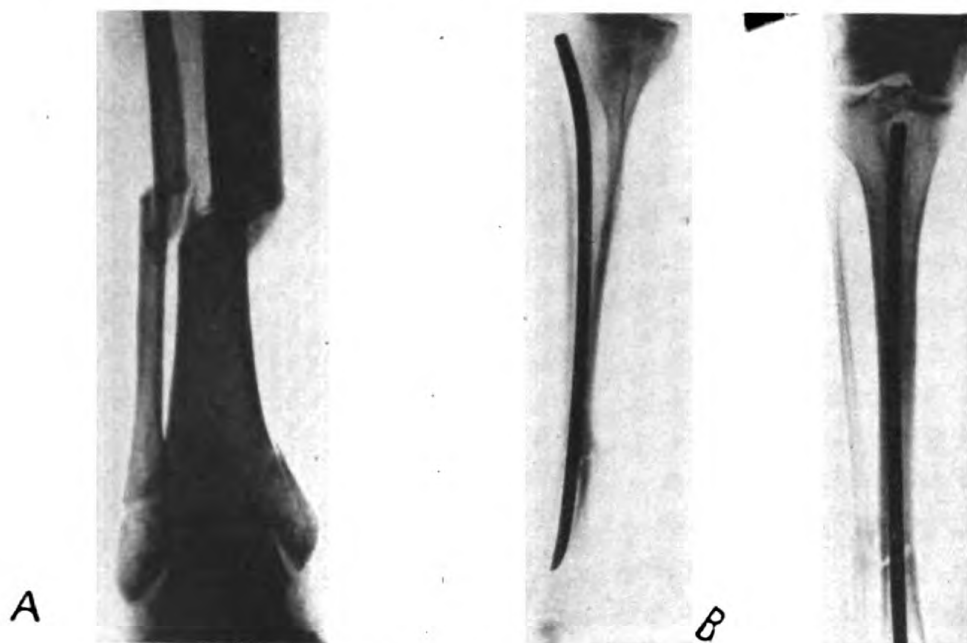


Figure 22a and b.

days later a U-splint was applied with which, 3 weeks after nailing, the limb was subjected to weight bearing. Twelve weeks after nailing the U-splint was removed, the fracture of the ankle bone had healed. Three weeks later the patient suffered pains and redness at site of insertion. Symptoms disappeared after 8 days of bed rest.

Three months after the operation the fibula had healed (fig. 22b). The fracture cleft of the tibia was gaping and the skin above the fracture site was flushed and warmer than the surrounding area. The fibula was resected and a U-splint applied. The fracture was bridged over with bone and was stable 5 weeks later (fig. 22c). The nail was then removed.

Fractures of this kind are better treated conservatively because of the danger of infection if the closed nailing is not successful.

In leg fractures it will hardly be possible to determine whether the



Figure 22c.



Figure 23a.

osteosynthesis is stable enough to make weight bearing possible. If there is any doubt, however, as to the stability of the fracture after study of the roentgenogram and a consideration of the type of fracture, it will be better to apply an additional plaster cast. Edema is always a symptom of insufficient stability. According to my own experience the only sure criterion is the subjective statement of the patient. If the patient complains about pains something must be wrong even if an additional plaster cast was applied. This is demonstrated by the following example:

Figure 23a shows a spiral fracture in the lower third. The nails applied were relatively short. After the application of a small ambulatory cast the fracture was subjected to painless weight bearing 8 days after the operation. A displacement did not occur. Four weeks after the operation the patient was released from the hospital and given ambulatory treatment with a plaster cast in place. Ten weeks

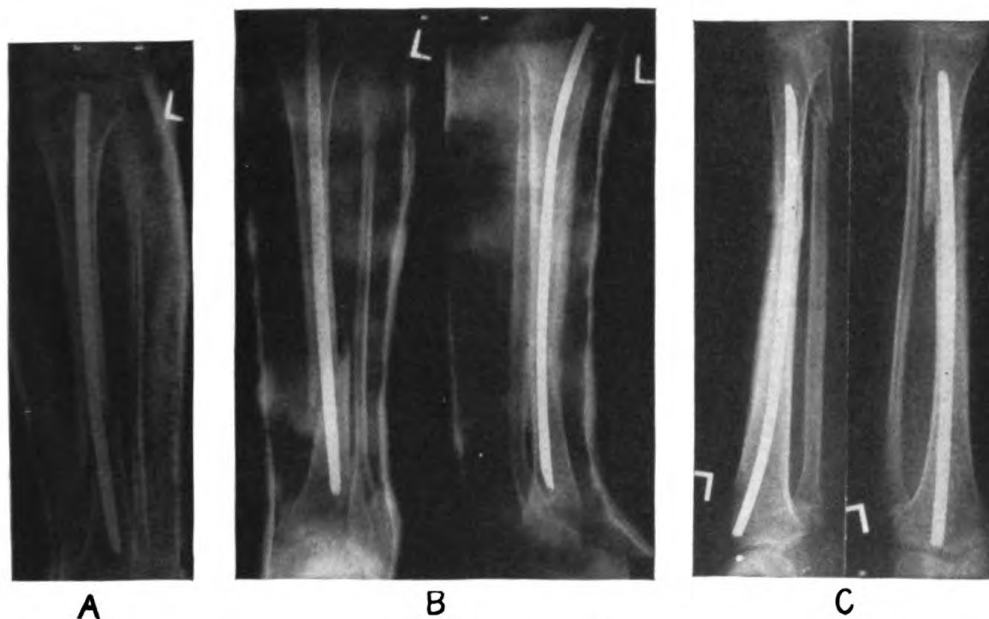


B



C

Figure 23b and c.

*Figure 24a, b, and c.*

after the operation the fracture was clinically healed. The formation of callus as observed in the roentgenogram, however, was not yet strong enough (fig. 23b). Therefore the nails were not removed. The fracture was subjected to weight bearing without a cast and 8 days later the patient started working. Six months after the operation the fracture was bridged over by good callus (fig. 23c) and subsequently the nails were extracted. Minor rarefaction about the nail tips proved that the nails were somewhat loose.

Figure 24a shows a fracture, similar to that shown in figure 23, of another patient who, in the first weight bearing with a walking cast, complained of pain at the fracture site. After a temporary observation the patient was considered hypersensitive. Fourteen days later roentgenogram revealed a slight valgus position which was counteracted during its repair by a plaster cast. The patient was confined to bed for a period of 8 days and after that the bone was sub-



D
Figure 24d.

jected to weight bearing. Again her complaint about pain was not taken seriously and 3 weeks later the fracture had slipped into the former valgus position and a slight curvature was observed (fig. 24b). The position was corrected, a cast applied, and the patient was kept in bed. Three months after the operation the roentgenogram (fig. 24c) showed beginning formation of callus. At the same time it was observed that the bone of the distal fragment was somewhat decalcified. From then on the patient did not complain of pain and because of air raids she was released from the hospital. Eight weeks later the ambulatory cast was removed. Examination 6½ months after nailing showed the fracture had healed with a slight recurvature in valgus position (fig. 24d).

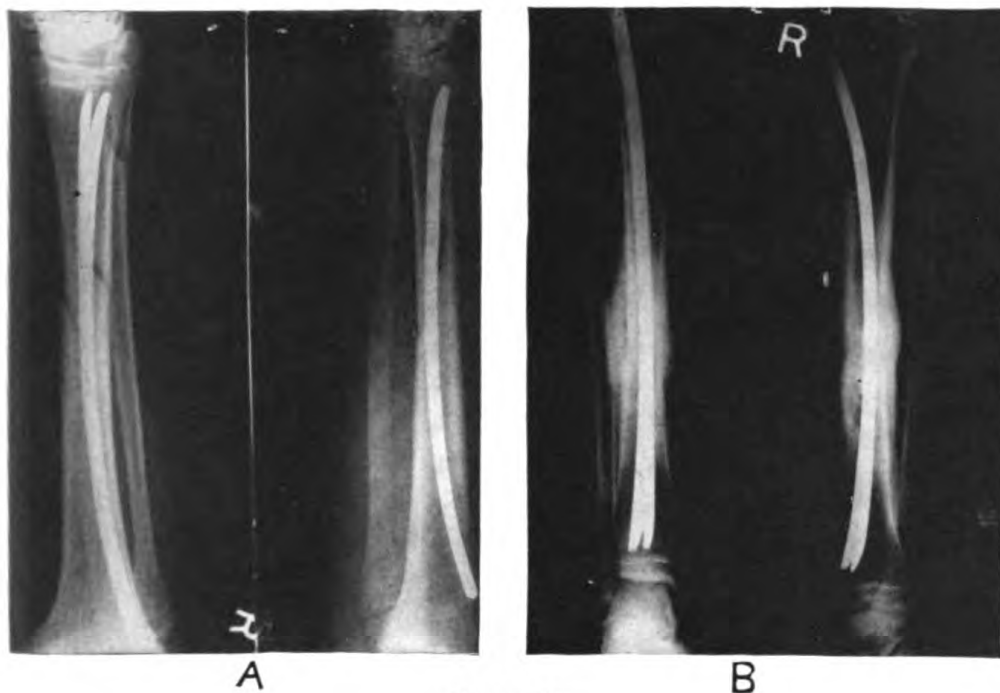
One should not trust the nail too much. On the contrary all warning symptoms, well-known from the conservative treatment of bone fractures, should be observed.

Kuentscher and Maatz write in their publication on the marrow nail operations: "It is useless to insert a nail in a fracture of the tibia so far, that the point of the nail gets a hold in the distal spongy portion of the bone. This hold is negligible and unreliable."

In their explanation they point out that tissue (and also bone) which is subjected to rhythmic pressure reacts with absorption at the point of impact. This is certainly true, but, if in a leg fracture the nail is inserted deeply enough, if it is driven in as far as near the epiphysis, this hold will suffice to stabilize the fracture so much that the patient may use the broken limb and the fracture will come to bony healing before the resorption begins.

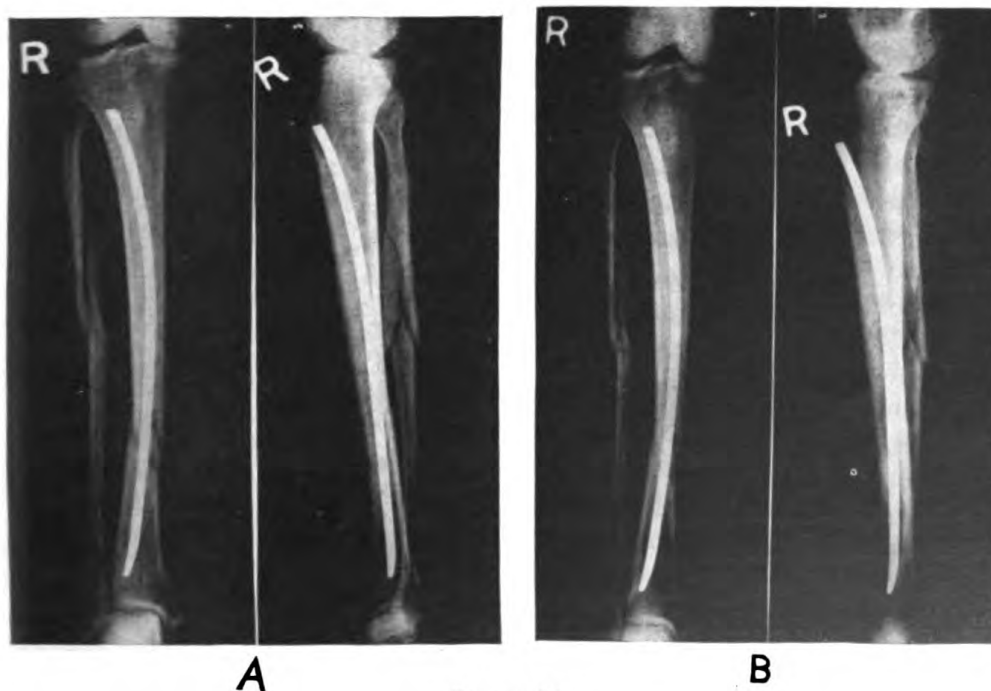
This was proved by the spiral fracture illustrated by figure 25a in which the fracture cleft extends downward considerably. The patient used the broken limb, without any additional cast 10 days after the operation, without experiencing pain. Four weeks after the operation he started working. Figure 25b which was taken 3 months after the operation does not show any rarefactions in the vicinity of the nail point. This proves that the nail had forged a stabile union with the bone. Thus it must be concluded that the deeper insertion of the nail saves the trouble of using the more complicated leg nails.

We were never obliged to apply an additional wire traction. In spiral fractures in which the nails were too short and too thin, the fragments did not shift in the cast if early weight bearing was avoided. Figure 26a is a spiral fracture of the leg of a 40-year-old woman 8 weeks after nailing. Although a thin nail was used which extended only 1 centimeter beyond the spiral fracture, the patient was able to subject the limb to painless weight bearing with the cast in place and was released from the hospital for ambulatory treatment. The nail

*Figure 25.*

had been inserted lateral to the tibial tuberosity and consequently a slight varus position occurred.

Figure 26b was taken 5 months after the operation. The fracture was bridged over by bone and the nail was removed. A walking cast

*Figure 26.*

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was applied for 3 months and after that the limb was subjected to painless weight bearing.

From experience gained in treating 21 cases of such fractures, the isolated shaft fractures of the tibia are particularly suitable for nailing operation. Fractures of that kind, particularly transverse fractures, take a long time to heal when conservative treatment is used (1 to 2 years according to Boehler). They also show a tendency to heal in faulty position due to the blocking effect of the fibula. With the marrow nailing, however, a quick and unimpaired formation of callus is obtained and employability is quickly restored. Figure 27a

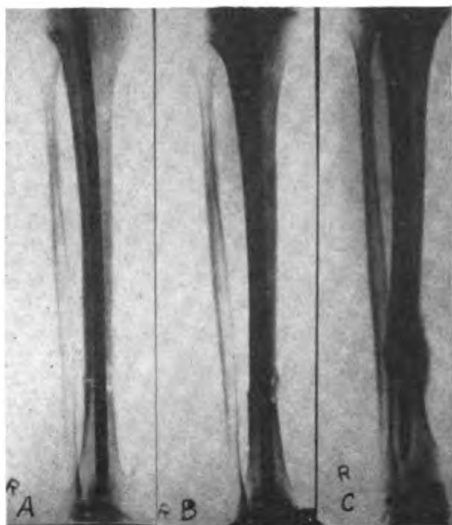


Figure 27.

is an isolated simple fracture of the tibia in a 40-year-old soldier after the nailing. Clinically the fracture is stable but the fracture cleft is still gaping. The patient subjected the limb to weight bearing without a cast 6 days after the operation. Figure 27b was taken 14 days after nailing. The fragments were firmly pressed together by weight bearing. The patient was released from the hospital as fit for service, except for assignment requiring marching, 5 weeks after nailing. The fracture was bridged over by bone (fig. 27c) 15 weeks after the operation.

With regard to my own experience I cannot agree with Boehler's restrictions (second edition of his publication) as to nailing fresh simple leg fractures. On the contrary our indication is rather extended, for the operation is simple from the technical point of view and it does by no means cause an additional strain upon the patient. Those physicians, however, who do not know the fundamental principles in treating bone fractures should not be allowed to make use of the marrow nail operation. Such a physician will not achieve good results even in case of a conservative treatment.

FRACTURES OF THE HUMERUS

One hundred and thirty-one of a total of one hundred and forty-one cases of nailed fresh fractures in the humerus were studied as to their course until healing was achieved. The duration of the treatment and the results achieved are demonstrated by table 4.

TABLE 4.—*Duration of treatment and results achieved by marrow nailings of fresh simple upper arm fractures*

Hospital	Number of cases	Average number of days' treatment in hospital	Average number of days for restoration for employability	Final results		
				I ¹	II ²	III ³
Military.....	78	108	177	76	2	0
Civilian.....	53	41	78	52	0	1
Total.....	131	78	112	⁴ 128	⁵ 2	⁶ 1

¹ Healing without any shortening, curvature, or impediment of the joints.² Slight curvature, shortening, or impediment of the joints (decrease in employability, less than 20 percent).³ Marked shortening, curvature, or impediment of the joints (decrease in employability from 20 to 50 percent).⁴ 97.7 percent.⁵ 1.5 percent.⁶ 0.8 percent.

Again we see a discrepancy between the duration of treatment in civilian and military hospitals. This discrepancy may be explained by the same facts previously mentioned.

Comparable statistics as to the duration of the conservative treatment are not available. The kind of employability as well as the stay in the hospital is not substantially shorter on an average. If necessary, fractures of the humerus may be treated as ambulatory patients. Nailing has one great advantage in that an abduction splint,

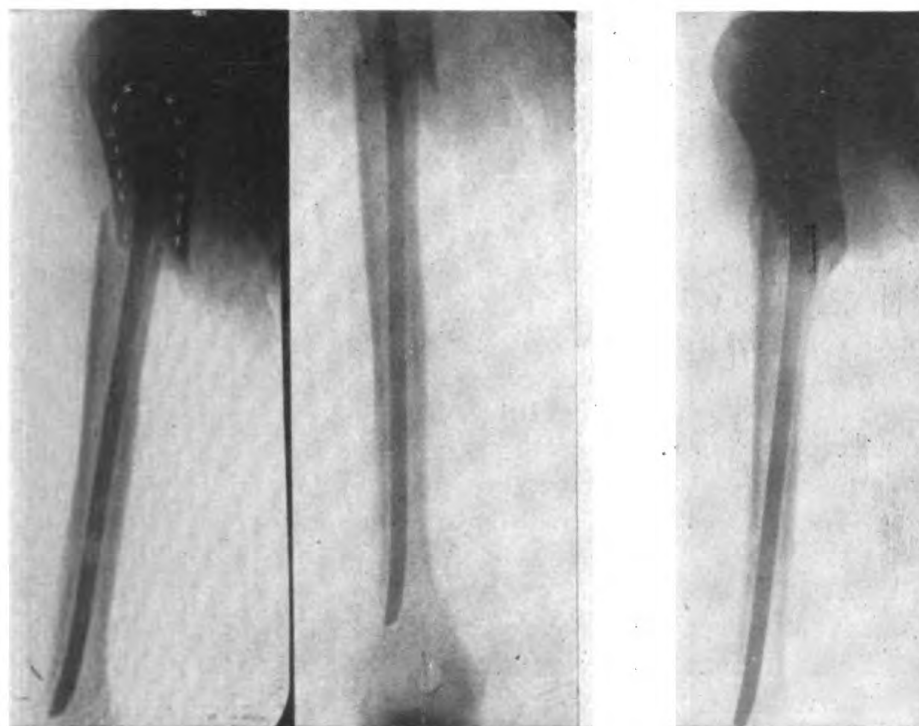


Figure 28a.

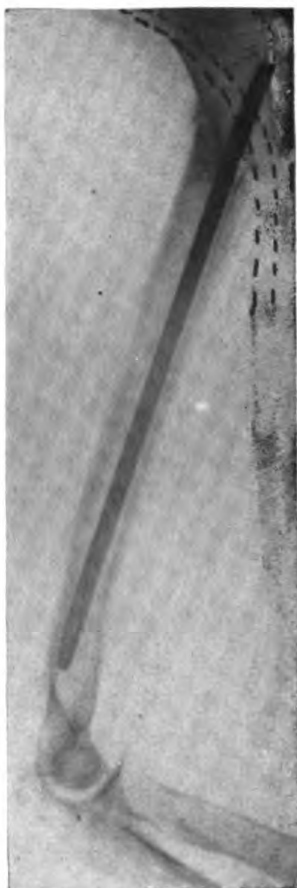


Figure 28b.

as a rule, is unnecessary. As to our own patients it must be taken for granted that early employability was obtained.

The results obtained are by all means better: Boehler has observed that 82 percent of the patients treated in emergency hospitals and 22.2 percent of those treated as ambulatory patients did not receive any annuities after 3 years. In all the cases treated in our hospital only one patient received an annuity of 20 percent.

In our first nailing of a fracture of the humerus an infection at the nail insertion site occurred but it did not cause any general reaction. Later on, however, it caused the formation of sequestra in the fracture site because the osteosynthesis was not sufficiently stabile. An impediment of 20 percent in extension and a slight impediment of rotation of the forearm occurred. A transverse fracture of the humerus in the upper third resulted in a slight curvature. After nailing the fracture was in good condition from above but the nail was inserted too far distally and was bent laterally (fig. 28a). The only hold the nail had in the marrow cavity was the thin cortex of the insertion site. The hole drilled there by means of an awl was larger than the diameter of the nail. This condition was not observed and the patient subjected the limb to active use 6 days later. A roentgenogram which was taken 8 days later (because a diffuse swelling of the humerus was observed and the patient complained of pain in the arm) showed a lateral and backward angulation had occurred. Figure 28b taken 3½ months later shows that the fracture had healed in angulation. The nail should have been inserted more proximally and its bending should have been stronger so that it could find a hold on the opposite cortex (correct position of the nail). Otherwise such fractures must be nailed distally and the nail driven into the spongiosa of the head. Impediment of the joints and limb was not observed.

Proximally located fractures require an insertion of the nail in the vicinity of the greater tuberosity. The nail should be bent at the head end so that it may jam in the cortex of the opposite side as demonstrated in figure 29b (even if this is done the osteosynthesis stays only relatively stabile and early weight bearing must be avoided). The nail will never find sufficient hold at the insertion

site. The hole in the bone is drilled with an awl and therefore it will always differ from the nail as to size and shape. Beside this the cortex is so thin that it may break easily when the sharp edges of the nail make pressure on it. Figure 29a shows a fracture of the surgical neck of the arm above the elbow after nailing. The exterior had a stronger curvature, the inner nail was somewhat S-shaped at its top. The nails spread in the head and found sufficient hold. The fracture cleft was still wide. The arm was put in a sling for 3 days after which it was subjected to active exercise. Ten days later the patient was released from the hospital for ambulatory treatment. Eight weeks later, because of continued exercise (fig. 29b), it was

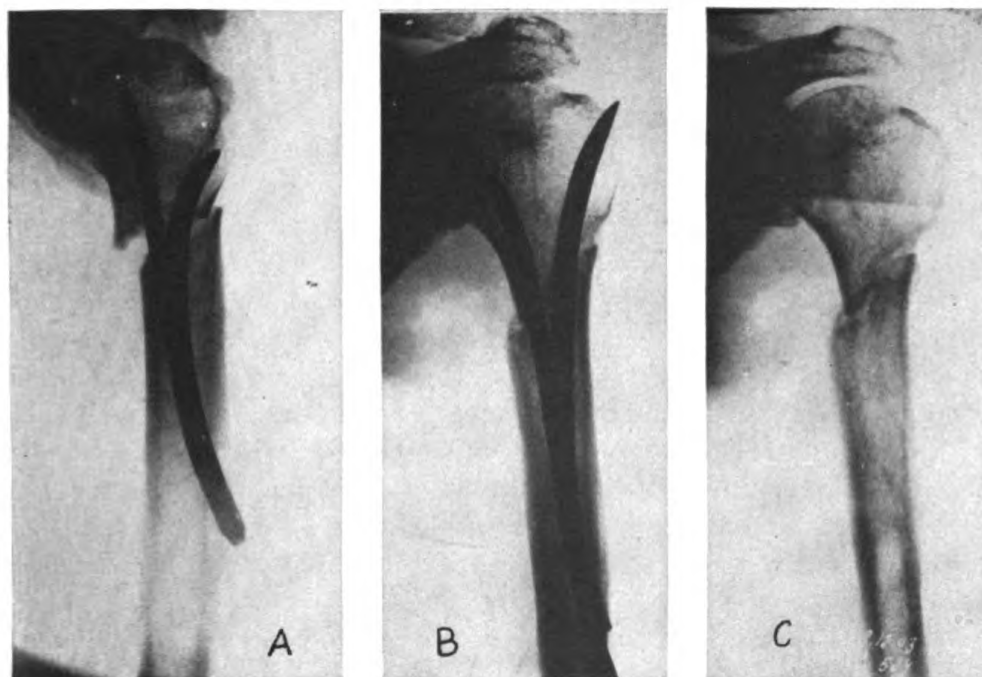


Figure 29.

noted that the fragments were pressed together, the nails were jamming in the marrow cavity of the distal fragment and consequently they had worked farther into the head and the outer nail perforated the bone. The inner nail had worked its way into the distal fragment and had stayed in its former position. The arm could not be raised higher than 90° because of the irritating effect of the nail tip. The nails had to be removed although the callus was not firm. The impediment of the shoulder had decreased 12 weeks after the operation (fig. 29c) and 3 months later had disappeared.

It is better to nail fractures of this kind from the distal end, particularly in these cases in which the proximal fragment is shorter. In this way an opening of the hemorrhagic soft parts is avoided and

the danger of infection is reduced. The nails must be driven in beyond the line of growth into the head. In this case it is useful to insert the nail above the middle of the humerus (if the hematoma does not extend that far). A thicker nail gets a stronger curvature, the inner thin nail is bent at its point in the opposite direction, thus it has the shape of an **S**. The nails spread (similar to the system of turn-spread nails) in the head and find sufficient hold there. The fracture must be strongly pressed together. If one forgets to do this the nail point may perforate the head (fig. 29a). The nails jam so strongly in the distal fragment that they meet the least resistance in the spongiosa of the head end. If this perforation occurs outside the joint plane it is of no significance. An injury of the joint cartilage, however, would cause the serious disturbances which are so well-known in connection with the nailing of the neck of the femur. Therefore the nail must not be driven too closely to the joint plane.

For a long time these fractures in the neck of the humerus were treated with the abduction splint and the traction bandage. After thorough treatment of those fractures it will be possible to obtain such a strong jamming effect in most of the cases, that 8 to 10 days later a Desault bandage can be applied. After that the limb may be subjected to movements. This kind of treatment is considered to be the most simple and is well tolerated. Therefore we do not want to nail those types of fractures on principle, as we do fractures of the neck of the femur. That is the reason why so far only three fractures of that kind were nailed: because a jamming effect could not be attained.

So far our experience has been so good that we prefer the nailing operation rather than an abduction splint, in fracture of the shaft of the humerus.

In the distal third of the humerus the marrow cavity is often narrower in the sagittal section than in the frontal section. The outer nail of the double nail is broader and higher at the point and therefore in such cases the front edge of the nail must lie in the frontal plane. This means that the nail must be inserted at the posterior edge of the greater tuberosity at such an angle that the opening of the transverse section points to the bent side. Otherwise the nail may rotate or break. Figure 30a shows a roentgenogram taken to determine the length of the nail in a transverse fracture of the humerus between the middle and lower third. The nail was laying laterally and not at the extensor side, consequently its distance from the film was less than that of the bone in the frontal picture. We were deceived as to the relation of the nail to the marrow cavity, which in this case was particularly narrow; also the nail was brought into a distal position whereas the operation must be made from the proximal side.

It was not observed that the marrow cavity was narrower in the frontal direction than in the sagittal direction (fig. 30b). The nail was inserted with the anterior edge in lateral position (too far in front) and consequently the nail cracked a piece of the bone on its flexor side. Due to the fact that the length of the nail was determined from the distal end, it projected too much and consequently it had to be replaced by a shorter nail. It had turned so much in the distal fragment that its diameter equaled that of the marrow cavity. When the nail was inserted into the distal marrow cavity the alignment was displaced because the nail had left the guide wire in front. This angulation was corrected after the complete insertion of the nail. It was impossible to insert the thinner inner nail.

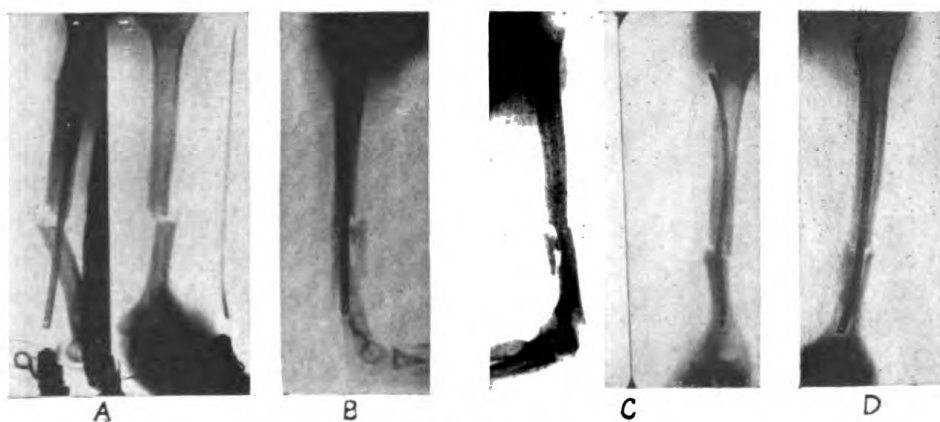


Figure 30.

Four weeks after the operation, the arm could be subjected to painless manipulation, but 1 week later, due to a sudden strain that the arm had been subjected to, the nail cracked at the site of the fracture (fig. 30c). This picture is a front view and the distortion is distinctly visible.

The broken nail was removed (the distal piece of the nail was extracted through a hole made in the bone above the olecranon fossa) and a new nail was immediately inserted distally (fig. 30d). The new nail lay in correct position and consequently both nails could be used without difficulty. The osteosynthesis was so stabile that 10 days later the patient could do some exercise. Six weeks after the second operation the patient was released from the hospital fit for duty. The nail was removed 3 months after the second operation.

Figure 31a is a roentgenogram of a transverse fracture of the humerus 8 months after the proximal nailing which was done at another hospital. After the nailing the patient was confined to bed for 4 weeks without a splint, because of restlessness. After that the

limb was subjected to some exercise for a long period of time; this was harmful. The patient complained of pains several times when using the arm. From a clinical point of view the fracture appeared stabile. The nail head had slipped into the bone and consequently did not hold. The rarefactions in the roentgenogram proved that the nail was "working." The delayed formation of callus was due to the constant waddling movement at the fracture cleft. This was not observed and the nail was removed because of the irritated margins. After the removal of the nail a distinct springiness was observed clinically. A slight bending occurred which was due to the firmly pressing together of the fragments (fig. 31b). The fracture was immobilized in an abduction splint and healed in 6 weeks. The delayed formation of callus was due to the unstable osteosynthesis.

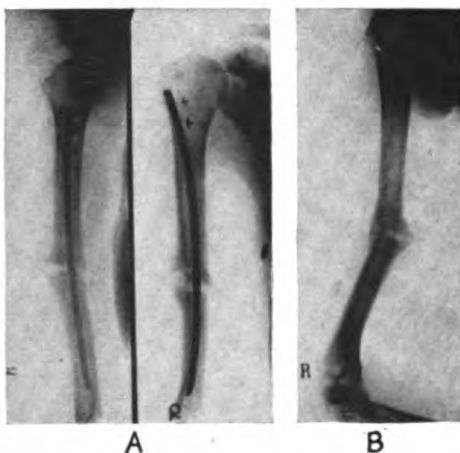


Figure 31.

If the osteosynthesis is stabile, after the nailing, the arm must be supported by means of a sling. The shoulder joint may be moved 3 to 4 days later, the elbow joint, however, only after a lapse of 1 week. The sling must be kept on for at least 14 days.

Motion should by no means cause pain. The osteosynthesis must be considered as not sufficiently stabile if pain and swelling occur during or after the use of the limb. In such a case the arm must be held by an abduction

splint during daytime and exercises must be made as soon as painless movements are possible. In these exercises the bending of the elbow is especially valuable. Motion by means of the pulley-traction method should be avoided because this method favors a distraction of the fracture.

In case of an insertion from above, the nail should be long enough and driven into the distal marrow cavity very firmly (strong counter-pressure from the elbow). It is not easy, however, to determine the exact length of the nail. The diameter of the distal marrow cavity must be measured thoroughly. Roentgenograms are taken with the nail laying close to the bone. The diameters must be compared with one another and during the operation care must be taken that the nail is laying in the proper plane. In doubtful cases it is better to insert the nail somewhat more distally from the tuberosity if the fracture is suitable for this kind of treatment. If necessary the nail may stick out a little bit more and a harmful effect is not to be expected. This



A B

Figure 32.



A B

Figure 33.

procedure is not so harmful as is too deep an insertion of the nail.

Figure 32a is a transverse fracture of the humerus which was nailed proximally. The nail was too short and did not find sufficient hold in the distal marrow cavity. Ten days later the patient subjected the arm to exercise (without the arm sling) which caused pain. The fracture was distracted 3 weeks later because of the weight of the arm (fig. 32b). The distal fragment slipped from the nail, and as a result the arm was put on an abduction splint, on which motion of the elbow was possible. The splint was removed 4 weeks later and the patient released from the hospital. The patient was able to work 8 weeks after the operation and the nail was removed 4 months after nailing.

Figure 33a is a transverse fracture of the humerus in a 41-year-old workman in which the nail jammed in the distal fragment of the very narrow marrow cavity. It was impossible to insert it farther and the fracture cleft is gaping. The arm was placed in an arm sling for 8 days after which it was subjected to some active exercise in the sling. The patient was released from the hospital 3 weeks after the operation.

Four weeks after the operation the fragments were pressed together by strain put on the arm and consequently the nail moved upward and slipped out of the bone (fig. 33b). Abduction was not hindered and there was a distinct formation of callus. The patient returned to work 6 weeks after the operation.

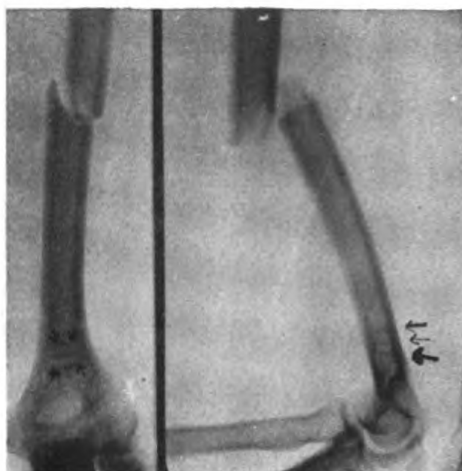


Figure 34.

Spongy transverse spicules may permeate the marrow cavity (fig. 34) so that the (blunt) nail cannot penetrate them. These spicules may not always be observed on the roentgenogram.

If the fracture is in the distal third and the nail does not get sufficient hold, complications of all kinds may occur (angulation or poor or delayed formation of callus) because of "instabile osteosynthesis." Therefore we nail fractures in the distal third from below (contrary to Boehler and

Kuentscher). A possible exposure of hemorrhagically infiltrated soft parts seems to be less dangerous than the lack of stability. Transverse spicules possibly hindering the insertion of the nail may be pierced by means of a drill awl or an electric drill.

Figure 35a shows a spiral fracture of the humerus just above the elbow after the insertion of the nail. The double nail found sufficient hold in the broad proximal marrow cavity. The drain to relieve the hematoma in the wound was removed 24 hours post-operatively. The arm was put into a sling for 8 days and after that it was subjected to some exercise that caused the patient no pain. The patient was released from the hospital 12 days after the operation and started to work



Figure 35a.

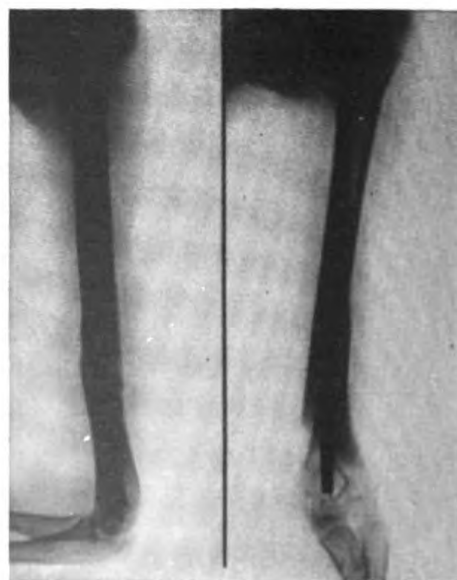


Figure 35b.

3 weeks post-operatively. Seven weeks after the operation (fig. 35b) the fracture had healed.

Figure 36a is a roentgenogram of a transverse fracture of the humerus in the middle third which was nailed distally without exposure of the fracture. The distal marrow cavity showed heavy spicules which made it impossible to insert a thick nail any farther. A piece of bone was broken off at the site of the insertion, therefore a thin nail only was driven into the spongiosa of the head. The nail found a good hold and 8 days later the limb was subjected to exercise which was painless. The existing paralysis of the radial nerve improved after a lapse of 3 weeks. Three months after nailing (fig. 36b) the nail was removed and 5 months after this the paralysis of the radial nerve recovered.

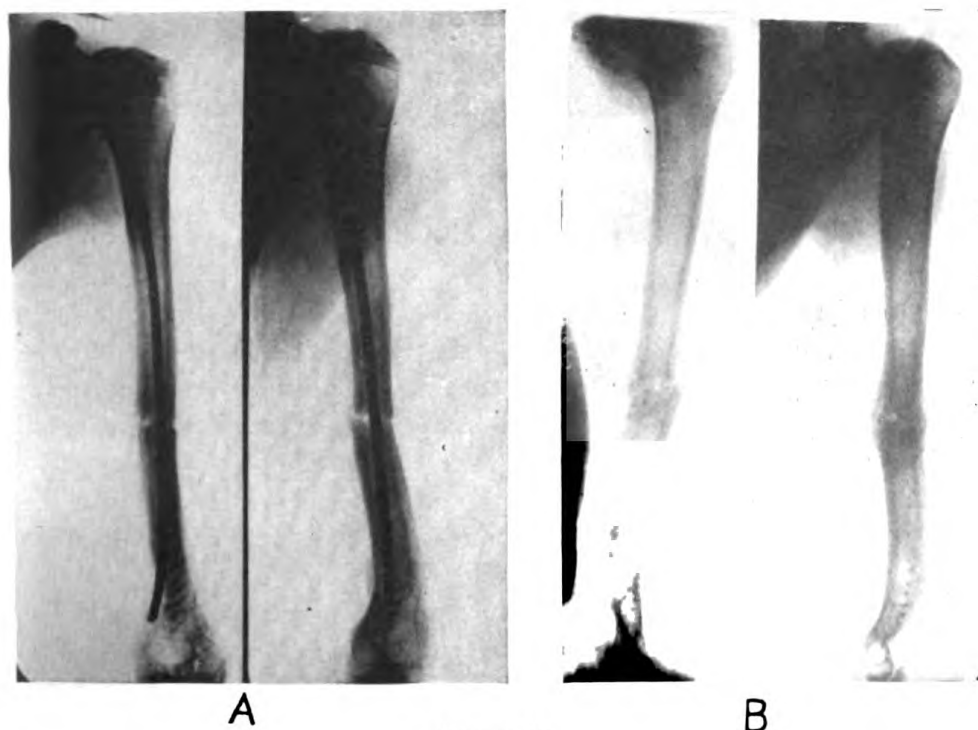


Figure 36.

If the marrow cavity is very narrow at the distal end the double nail may split the bone.

A transverse fracture of the humerus without damage of the radial nerve was nailed distally with a double nail (fig. 37a). At the fracture site the marrow cavity broadened so much that the nails did not find sufficient hold there. In addition the nails were too short so the osteosynthesis was not stable. The limb could not be subjected to exercise until 9 weeks after the operation. Twelve weeks after the operation (fig. 37b) the fracture cleft was wide open. Slight callus

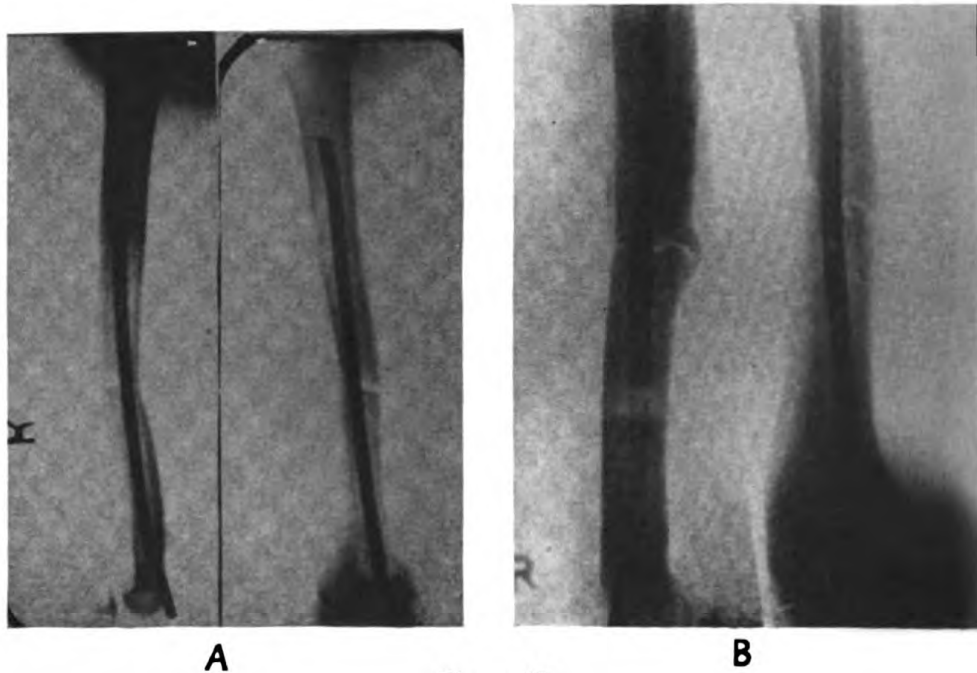


Figure 37.

flanges that united the bone ends could be observed. The nail was extracted 18 weeks post-operatively.

In such a case the only thing to do is to use a thinner nail. It must by all means be driven into the spongiosa of the head beyond the line of growth. This is especially true as to fractures situated proximally. Beyond the junction of the middle and the lower thirds, the marrow cavity is considerably enlarged so that even a double nail sometimes may not find sufficient hold if it is not driven into the head. If this is not done disturbances of the formation of callus may occur.

It was previously pointed out that possible damage to the radial nerve is an indication for the exposure of the fracture. As demonstrated by figure 36 we are very cautious in this respect. If, after a thorough clinical and neurological examination, it is indicated that the possible damage may be of a temporary nature the nerve should not be exposed at that time. If, however, the paralysis does not subside, exposure and eventual nerve suture may still be done after 6 to 8 weeks.

Symptoms of primary injury of the radial nerve was observed five times, and in four cases these symptoms subsided after closed marrow nailing. In the fifth case, 6 weeks after the nailing the nerve was exposed and successfully sutured. Contrary to the findings of Hart jamming of the nerve between the fracture fragments was not observed and therefore it must be concluded that this does not often occur.

FRACTURES OF THE FOREARM

The courses of 15 out of 18 cases of fresh closed fractures of the forearm were observed until a final healing occurred, but from this small number of cases it is impossible to come to any final conclusions.

Schneider asserted that, for anatomical reasons, it is impossible to nail the ulna. This is incorrect as Boehler and I have successfully nailed the ulna.

The isolated shaft fractures of the ulna seem to be especially suitable for nail operations. From a technical point of view the operation is not difficult and the straight ulna gives a stabile osteosynthesis with good mechanical conditions for the formation of callus. With the conservative treatment, however, the fractures show a tendency to faulty positions or a delayed callus formation because of the blocking effect of the radius.

Five out of seven uncomplicated ulna fractures healed well, no disturbances were observed, and 4 to 5 weeks later the patients were able to resume their work. The fracture clefts, however, were visible for a relatively long period of time and consequently the nails were not removed until 3 to 5 months later.

In two cases the nail was too short and consequently a formation of "stimulated" callus or a delayed formation of callus was observed. Figure 38a shows a transverse fracture of the ulna after nailing. Good position was obtained but the nail was too short. The patient began exercising the arm 6 days after the operation and 8 days later he was released from the hospital. After a lapse of 3 weeks he was able to resume work. Ten weeks after the operation (fig. 38b) a stabile osteosynthesis was still not evident. Constant movement at the fracture site because of an unstable osteosynthesis produced a bridging-over by stimulated callus. Rarefactions around the nail point caused some erosion of the cortex on the radial side. Because the patient constantly used his arm a slot formed in the (bridge) callus so that the rotary movements were not hindered.

Figure 39a shows a jagged transverse fracture of the ulna after



Figure 38.

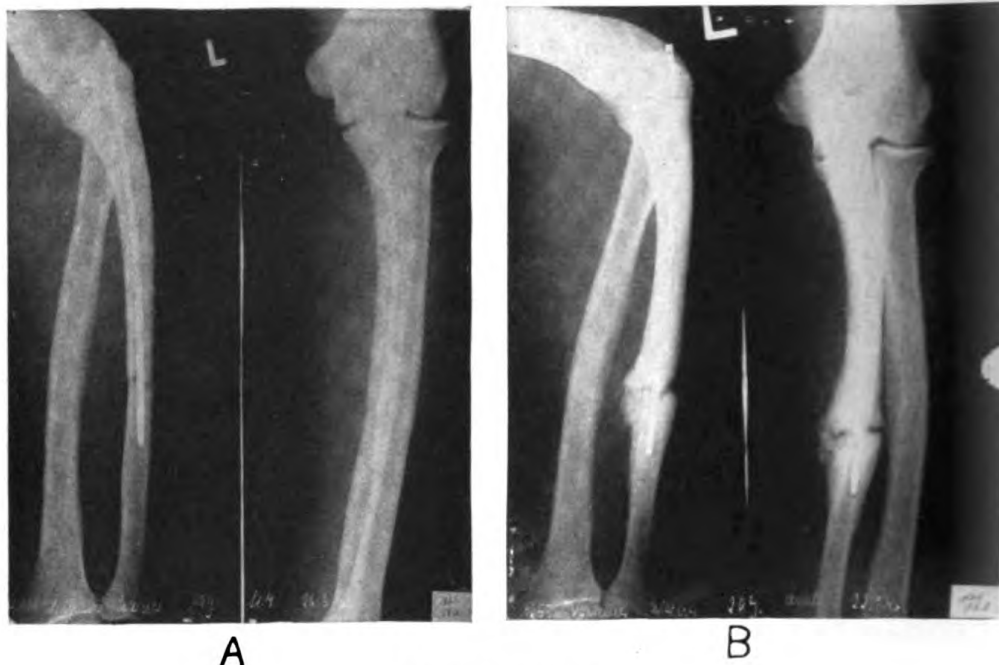


Figure 39a and b.

nailing by the open method. This method was used because the operative reposition was unsuccessful. The position shown is ideal but the nail was too short. Figure 39b was taken 4 months post-operatively. The patient was able to use his arm without pain. There was a "stimulated" callus with a formation of flanges that were not

united because of the instability of the fracture. Rarefactions around the nail tip which, in the direction of the radius, have nearly penetrated the cortex. Periosteally new bone formation is observed.

Two and a half months later the fracture cleft was bridged over by bone (fig. 39c). The nail point was firmly imbedded and the rarefaction around the nail tip was less marked. The periosteally formed bone structure was much better.

In one case we had to deal with a fracture which was complicated by damage to the brachial plexus and luxation of the head of the radius (fig. 40a). Also, a transverse fracture of the other humerus had occurred; this was nailed at the same



Figure 39c.

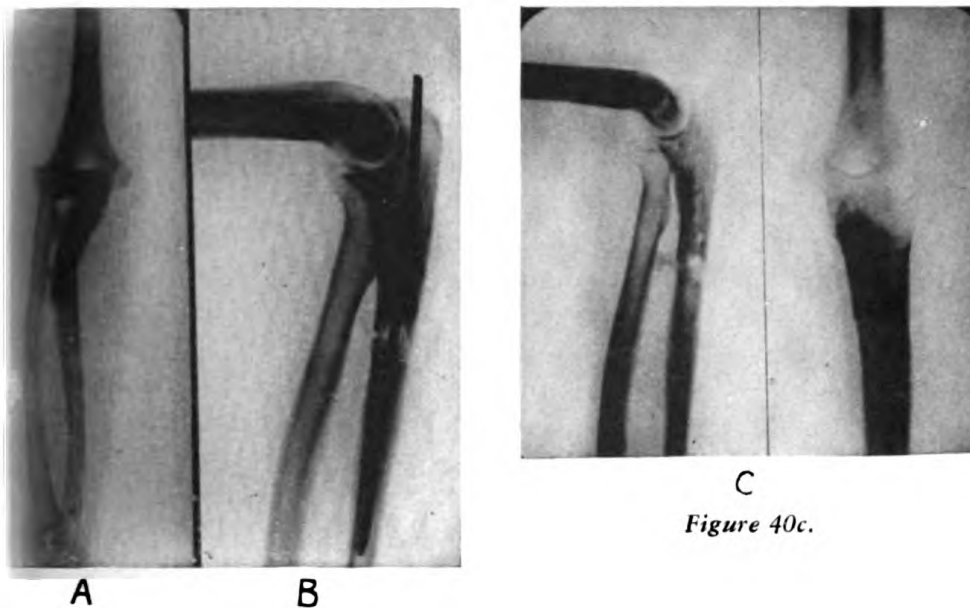


Figure 40a and b.

Figure 40c.

time. The nail was sticking out of the bone (fig. 40b) and an inflammation at the insertion site had occurred because of the early use of the limb (4 weeks after the operation). The physician failed to immobilize the limb or to remove the nail and thus an abscess appeared at the fracture site. This had to be opened. After a lapse of 10 weeks the nail was removed and the wounds quickly healed. An infection of the marrow cavity or the formation of sequestra did not occur (fig. 40c).

At the olecranon the nail may stick out 3 millimeters at the most and therefore it must be inserted up to the eye. If the nail is too long or if it jams in the distal fragment and consequently causes a widening of the fracture cleft the nail must be pinched off and the sectional area be smoothed with a file. If the patient suffers from pain at the insertion site, because the nail was not inserted deep enough or because the nail has worked its way out of the bone, the limb must be immobilized in an extended position and the nail removed as soon as possible.

The nails should be as long as possible, otherwise the fracture site will not get sufficient support. In the ulna, which is relatively soft, the nail will soon become loose. If in such a case the nail is too short, rotation at the fracture cleft will occur and "stimulated" callus and delayed formation of callus must be taken into consideration.

It seems to be unsuitable to use a simple piece of wire for the "nailing" operation. The wire is not strong enough to prevent lateral displacement of the fragments. If the marrow cavity is really too

narrow or if a correspondingly thin nail is not available it will be better to treat the fracture conservatively or (especially in fractures in the upper third) to apply either a Lane's plate or a wire loop.

Due to mechanical conditions isolated fractures of the shaft of the radius also show a tendency to a delayed callus formation.

An intact ulna will make it more difficult to bring the fragments together accurately and the condition will be more complicated if a physiological absorption of the ends of the fragments occurs. In cases of that kind the ulna acts as a spring so that the fragments are not pressed together by the muscles, but instead, they are moved one against the other in a lateral direction. Therefore we have to deal with movements which are especially inimical to the formation of callus. These movements cannot be completely compensated for by means of the circular plaster cast because of the relatively thick pad of muscles. It is only possible to "buffer" them.

The introduction of the marrow nail method was expected to cause a change for the better. It must however, be kept in mind that the thin radius nail is not absolutely stiff, but evidently somewhat elastic. This was proved by our first marrow nail operation of that kind. Within 4 weeks after the nailing the patient was able to move his arm freely. The fragments were not firmly pressed together however, and the fracture slot seemed to be somewhat wider because of resorption. The patient assumed his former activities and complained of pain at the fracture site only when performing strenuous work. Swelling did not occur and the fracture was clinically healed. Roentgenograms however, showed no formation of callus. Nine months after

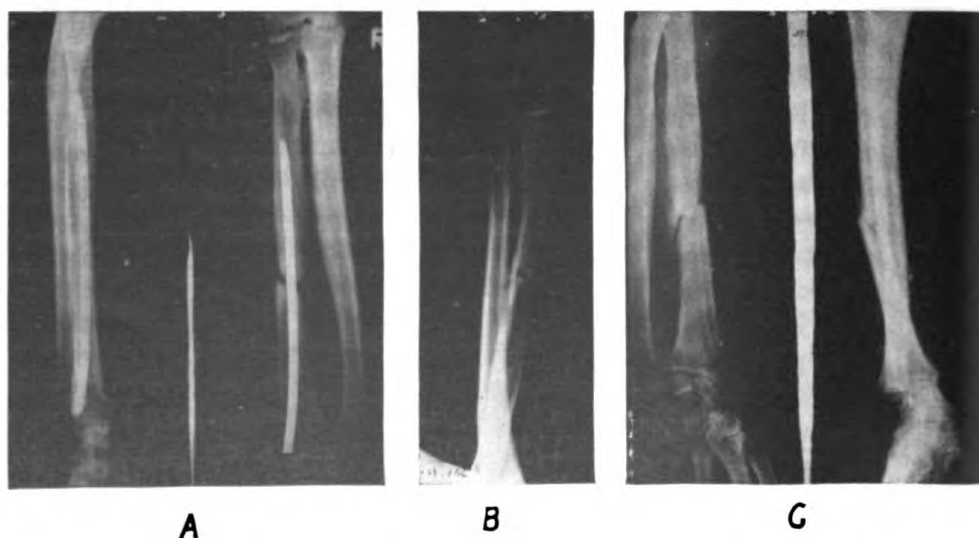


Figure 41.

the operation a slight bony bridging appeared (fig. 41a). The patient no longer complained of pains and therefore the nail was removed. Distinct elastic movements of the fracture were observed, therefore a plaster cast was applied. This was removed 6 weeks later because the fracture seemed to be healed, clinically and roentgenologically (fig. 41b). Ten days later these fragments were firmly united and a slight bending had occurred. Unfortunately it was not observed that this was due to a subluxation in the distal radius-ulna joint and consequently this position was not corrected. A bony healing was achieved but an impairment of the movements of the wrist could not be avoided (fig. 41c).

The nail had forged a stabile union but the bone did not show any reactions. The fracture cleft was gaping and the intact ulna prevented a pressing together of the fragments, therefore healing could not be obtained. The fracture should have been bent in the direction of the ulna after the nailing, so that the split-up part of the bone touched the distal fragment.

Illustration 42 demonstrates that healing could probably have been achieved. Also in this case (fig. 42a) the fracture cleft was gaping somewhat but at the radial side of the fracture the fragments touched one another. This patient was able to resume work 4 weeks

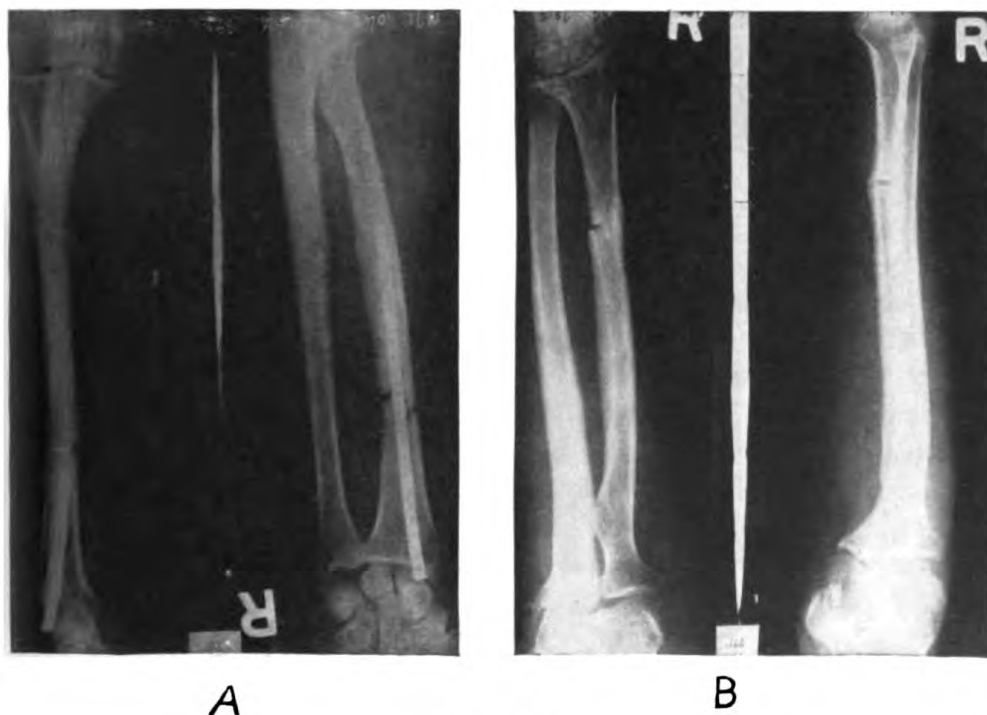


Figure 42.

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after the operation and the nail was removed 3 months later. The fracture was bridged over by bone on the radial side. On the ulnar side, however, the fracture slot still existed and the slight flange callus indicated that despite the presence of the nail slight movements must have taken place. Four weeks after the removal of the nail (fig. 42b) the fracture of the radial side was healed. The gaping cleft of the ulnar site, however, did not heal.

After the first unfavorable observation (the cause of which was found later) we were rather cautious as to nailing of fractures of the radius. Only in one case did we nail a fresh fracture of that kind, because it was impossible to keep the fracture in the proper position by means of the plaster cast. This patient had a fracture of the radius with luxation of the distal radius-ulna joint (fig. 43a). The fracture was

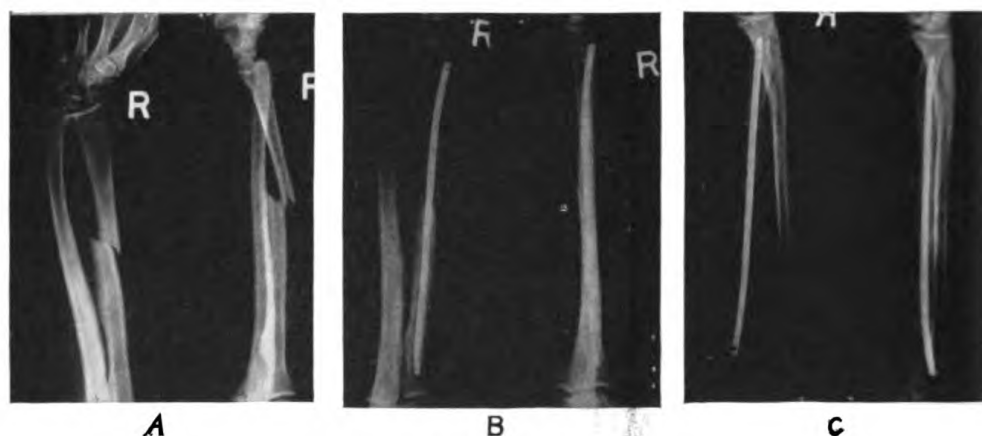


Figure 43.

in good position after nailing (fig. 43b). The luxation was corrected but the fracture cleft was gaping somewhat because of the effect of the ulna. The patient was released from the hospital 8 days later and resumed work 3 weeks later. Eleven weeks after nailing (fig. 43c) the fragments were firmly pressed together by the weight-bearing effect. The nail head had slipped out of the bone causing a subluxation of the radius-ulnar joint. This did not impede the arm movement. The fracture had bridged over and the nail was ready for removal.

Two out of three fractures which were nailed from the outside showed good results. In the third case the nail in the proximal fragment jammed so much that it was impossible to insert it up to the eye. In order to close the skin without tension the hand was immobilized in dorsiflexion. In cases of that kind it would be better to pinch the nail off, otherwise the advantages of the nailing method will not come into effect.

Fractures of both forearm bones were nailed only in those cases in which, after reduction and application of a cast, the fragments could not be held in the proper position. In the beginning we renounced the nailing of the radius under the condition that the fracture was in good position after the nailing of the ulna; a plaster splint was applied reaching to the arm above the elbow.

A disturbance of the healing process in radius fractures was not observed but a distinct decalcification of the wrist bones was observed despite the fact that the patient frequently moved the limb with the cast.

Recently we had two cases in which both bones were nailed and thus a plaster cast was not required. Both patients were able to use the arm freely after 4 weeks and the healing did not show any disturbances. Atrophy of the wrist joint was not observed. In comparison to the conservative treatment, the advantages gained by the nailing method are so great that we have decided to nail both bones from now on, if they are suitable for the nailing method.

THE DANGERS OF NAILING

The possibility of infection was one of the main reasons why many did not want to operate upon fresh simple fractures of the long shaft bones. It is impossible to deny that in many cases the indication for nailing was not strict enough and improper technique showed terrible results. With the closed nailing operation, however, only a small incision is necessary to insert the nail and therefore the danger of infection is less. Suppuration in the fracture cleft must be avoided.

According to the statistics at hand, in 458 cases of closed nailing operations primary suppurations occurred in 3 thigh fractures, in 1 fracture of the humerus, and in 2 forearm fractures. During the extraction of the nail an infection was observed in 1 thigh fracture, in 1 fracture of the humerus, and in 2 leg fractures.

In 4 out of 8 cases of primary infections the fracture cleft was impaired and in 2 death occurred because of infections in the thigh. All these cases are of course a serious set-back for the nailing method. We must take into consideration however, that all the infections could have been avoided, particularly those at the fracture cleft.

I was responsible for the following death. A 20-year-old pilot suffered a transverse fracture of the right femur in the middle third and first and third degree burns of the face, both arms, right leg, and buttocks. Fourteen days after the accident I decided to use a marrow nail as it was practically impossible to immobilize the fracture because of his marked restlessness and all movements of the patient caused unbearable pain. I was well aware of the danger of

infection considering the presence of suppurating wounds, nevertheless I hoped to be able to prevent an infection by the immobilization of the fracture, since the vicinity of the trochanter was unimpaired and good granulations of the wounds of the broken leg were observed. The previous experiences with the marrow nail operations justified this opinion. (A further reason why I decided to nail this fracture may be that a short time previously I had a chance to observe a fatal termination of an infection of a closed femur fracture with suppurating wounds of the leg which had been treated by wire extension.) After the nailing, the fever decreased considerably and the patient suffered no more pain from the fracture. Five days after the operation an infection of the intentionally unsutured operative wound occurred. This was immediately opened. Fourteen days after the operation an abscess at the fracture cleft was also opened widely. After that we observed a serious suppuration of the burns, especially at the buttocks, and septic temperature. Seven weeks after the operation suppuration of the knee joint occurred and the leg had to be amputated. The patient died as a result of this operation.

The amputated specimen showed ring sequestra at both ends of the fragments and dark gray granulations around the nail bed. Marrow suppuration was not observed. The infection of the knee joint was due to an adjacent abscess on the extensor side.

Let us leave the question undecided whether or not the infection of the fracture might have been prevented had the nailing not been done. There is no doubt, however, that new unpreventable injuries of the soft parts at the fracture site are produced by the manipulation and increase considerably the danger of infection. *As long as suppurating wounds exist in the body aseptic fractures should not be nailed* even if the nailing decreases the pain of the patient and facilitates his nursing.

In a similar case Boehler observed an infection of the hematoma at the fracture site. He is of the opinion that an infection can be avoided if the nail is applied before infection occurs. This is problematical because of lack of statistics on which to base judgment. It is our opinion, however, that an operation of that kind should be made only in emergency cases and if so the hematoma should be drained just as in nailed compound fractures. Infection of the hematoma is prone to occur in hematogenous infections.

The second death was attributable to improper technique and the wrong indications.

A 20-year-old pilot suffered a transverse fracture of the distal third of the left femur, wounds of the soft parts of the left leg, and a basal skull fracture. Immediate débridement of the wound was made and a

wire extension applied at the calcaneus because excoriations were observed in the vicinity of the tibial tuberosity. An abscess of the thigh and an infection of the calcaneus occurred. Nevertheless we decided to nail this fracture 8 days later "in order to obtain a good fixation of the fracture ends and because the patient appears to be very restless." The length of the nail was determined on the sound thigh because roentgenographic apparatus was not available with which a picture of the entire thigh (with the nail laid over the fracture) could be made. "The longest available nail just about fit." During the operation, however, it was observed that "the nail is a couple of centimeters too short," therefore the operation was stopped and the nail was left in the marrow cavity. A wire extension was attached to the tibia (fig. 44a). The operation wound healed primarily.

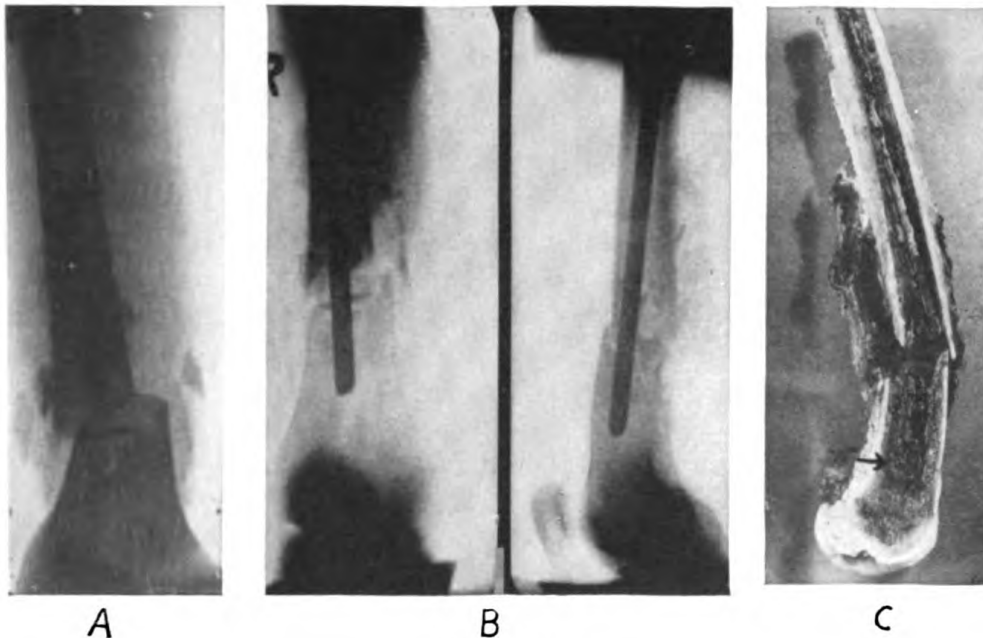


Figure 44.

Eight days after the operation a cast was applied because the patient was delirious. A decubitus ulcer occurred at the hollow of the knee and fever occurred. The roentgenogram showed "approximately proper axial position of the fragments." The decubitus ulcer in the hollow of the knee increased. Three weeks after the injury it was concluded that the permanent unrest of the patient required a repetition of the nailing operation in such a way that the first nail which was inserted previously should be driven in by means of a second nail, so that both of the fragments would be bridged over. After this operation was performed (fig. 44b) a pelvic cast was applied. One day after the

second operation the patient's temperature rose to 40° C. and an infection of the operative wound occurred, which was opened on the second day. Four days later an abscess at the fracture site was observed, from which 600 cubic centimeters of pus were drained. Precious time was lost by blood and urine tests and by fighting the sepsis with sulfonamides and blood transfusions. Three weeks later the limb was amputated but the patient could not withstand this added strain and died. Figure 44c shows the amputated specimen and the marrow abscess at the nail point.

The marrow nail does not get sufficient hold in a fracture which is located so distally and a stabile osteosynthesis can never be obtained, therefore an additional plaster cast is required. A nailing operation should never be made if the surgeon does not have a complete armamentarium at his disposal, otherwise technical difficulties will arise. The first condition is to determine the length of the nail as precisely as possible. After the first operation passed without infection, under no circumstances should a second operation have been performed, especially, after a decubitus ulcer was observed near the fracture site. The unavoidable injury of the soft parts caused by the reduction of the 3-week-old fracture must, under these circumstances, lead to an infection. The nail was not inserted deeply enough and consequently a marrow abscess around the nail point occurred. Let us leave the question undecided whether or not the life of the patient would have been saved by amputating the limb in which the sepsis had started. When considering that a wire extension could not be applied to the tibia the best thing to have done would have been to set the fracture as accurately as possible (eventually using an extension apparatus) and to apply a large plaster cast to the thigh. In case it was not possible to attain a good position of the bones such a malposition could have been corrected 4 to 6 weeks later, after the danger of infection no longer existed. Surgeons who do not know the principles of the conservative treatment of fractures should not be allowed to "nail."

An early repetition of the fruitless nailing seems to be particularly dangerous because of the possibility of infection. In the case of a femur fracture which has been described in detail we could not remove the nail which was not in good position. When the nailing was repeated 9 days later an infection of the wound occurred, although it did not extend beyond the fracture site because of the stabile osteosynthesis.

Kuentscher asserts that in simple fractures the infection is restricted to the insertion site. In two leg fractures and a fracture of the humerus, however, the fracture clefts were infected even though the wounds at the insertion site were immediately opened. In

all these cases a stabile osteosynthesis had not been obtained. Also in the case of chronic osteomyelitis after a femur nailing, and a serious infection after a leg nailing operation, a stabile osteosynthesis could not be achieved probably because of the extension of the infection.

If the nail is not firmly seated in the marrow cavity some displacement takes place because of movements of the limb. The spaces originating in this way absorb the purulent secretions. Thus the effect of the motion of a foreign body favors the process of infection.

Figure 45a illustrates a double leg fracture after nailing. The nailing operation was delayed for 14 days after injury, until a surface wound had healed. The distal fracture was immobilized by the nail but the osteosynthesis of the proximal fracture was not stabile. Five days after the operation both the insertion site of the nail and the proximal fracture hematoma became infected; this soon extended to

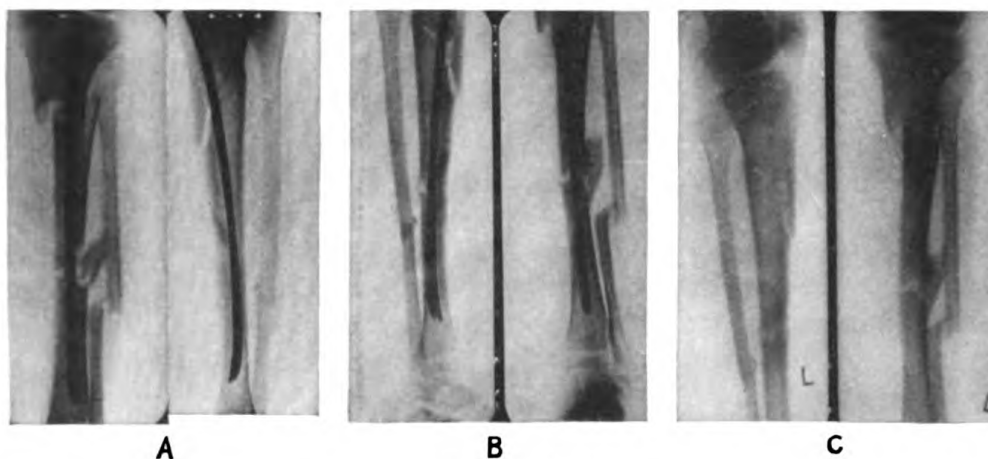


Figure 45.

the distal fracture hematoma. Wide incisions with drainage were made and the leg placed in a plaster cast. Infection of the bone was prevented. Three months later (fig. 45b) bony healing had occurred, no osteitis was observed, and the patient had subjected the limb to painless weight bearing for 8 days. Figure 45c was taken 2 months later. The nail had been removed 3 weeks before and the wound had been kept open. Ten days after this picture was taken the wound was healed. The patient's gait was unhampered, no edema was observed, and the shortening was one-half centimeter.

If an infection occurs in cases of fractures (particularly of the leg) in which the nail forges a stabile union because it was long enough and was driven into the spongiosa, the infection will be restricted to the insertion site if a wide opening of the wound is made immediately to permit drainage. The nail will become loose in 2 or 3 weeks because of the absorption of the spongy spicules and if any

strain is put on the limb before the wound has completely healed a late abscess may form at the fracture site. Therefore it is absolutely necessary to open the wound immediately and put the limb in a cast as long as any infection exists. It is also unwise to remove the nail before the fracture has healed because, by doing so, the nail bed will facilitate the spread of the infection.

In the case of a stabile osteosynthesis an immobilization of the limb is not necessary. The limb may be freely moved and the patient allowed out of bed after all acute symptoms have disappeared. This has been proved by experiences with the nailing of infected fractures. If the nail wound continues secreting after the fracture has healed the nail must be removed and the limb kept in such elevated position that the insertion site is at the lowest point. If this is not done a gravity abscess may occur in the marrow cavity.

It is reasonable to expect an infection or inflammation to occur when the nail (as in fractures of the forearm) projects from the wound. This may be prevented if the excess piece of nail is cut off and its edges smoothed with a file.

In all four cases of infections occurring after the extraction of the nail, complications arose because either adequate instruments for its removal were not available or because the nail had slipped into the bone. The limb was not kept immobilized and therefore in one case of a leg fracture a gravity abscess occurred at the fracture site. Healing occurred after an incision and drainage had been made.

I daresay, however, that after the *closed nailing of fresh fractures, infections are avoidable if the indications as well as the technique applied are correct.*

In only six cases was the method of the open nailing of fresh simple fractures used in which either a reduction was impossible or because the nail could not be introduced into the distal marrow cavity. Infections of the fracture cleft never occurred. In only one case of a femur fracture was an inflammation of the nail wound observed. In this case the nail was projecting too far out of the wound and this projecting piece of nail could not be removed because a metal saw was not available.

The author does not agree with Hart who contends that a fracture should be opened as soon as difficulties arise. If this is done the danger of infection is greatly increased. This was proved by experience with old fractures. If the technique applied is correct good results will always be achieved. The surgeon should never begin an operation until he is certain that the fragments can be brought into firm apposition. If this is impossible a wire extension should be applied. If a satisfactory position of the fragments cannot be ob-

tained by this process the operation may be repeated 1 or 2 weeks later. Should an open nailing be necessary at this later date, it would be more successful than to open the fracture cleft after needless attempts which only disturb the asepsis and damage the tissue.

DEATHS AFTER NAILING

An 84-year-old woman who had a subtrochanteric transverse fracture of the thigh was treated with a wire extension after the closed nailing had failed. Five weeks later she died of circulatory failure and pneumonia.

In the two other deaths in thigh fractures the post mortem examination showed a fat embolus. In one of the cases the fat embolus was due to the insertion of a second rod into the nail which had jammed with the first rod. Thus the pressure upon the marrow had become so great that massive fat and air embolism occurred.

Shock occurred in the other patient after spinal anesthesia. Nevertheless the nailing operation was performed after he had recovered and according to the records "rather strong forces" had to be used to insert the nail. The patient died 2 days after the operation. The post mortem examination showed an extensive pneumonia and a small fat embolus to which death could not be ascribed.

Three additional cases of fat embolus were observed at post mortem examinations. A 12-week-old thigh fracture which was in poor position was immobilized under anesthesia and a wire extension applied. Eight days later a closed nailing operation was performed because of the danger of infection. Due to difficulties encountered with this operation circulatory failure occurred and 4 hours after the operation the patient died. The post mortem examination showed massive fat embolism in both lungs. The fracture ends were closed by callus in which the nail was firmly seated.

In a thigh fracture 2½ months old that was nailed by the open method the (thinnest) thigh nail had jammed so much in the proximal fragment that repeated attempts were necessary to remove it in order to replace it with a leg nail. Kuentscher's tackle and pulley was used for this purpose causing the neck of the femur to crack. The insertion of the leg nail was so difficult that the operation lasted more than 2 hours and the patient collapsed during the operation. The post mortem examination revealed the existence of a fresh fracture of the neck of the femur and the greater trochanter was torn off (this was caused by the tackle and pulley), also a small fat embolus was observed but, according to the pathologists, death could not be ascribed to it.

FAT EMBOLISM

That a displacement of fat may be caused by marrow nailing is obvious because large quantities of marrow and also numerous vessels are damaged by the insertion of the nail.

Animal tests by Maatz proved that a fat displacement does occur, but "it is so little that it is of no importance even if four large tube bones are nailed at the same time."

After all, the danger of a fatal embolus is little because the insertion hole is larger than the cross section of the nail. Thus the bone marrow may drain off by the nail wound and a considerable overpressure is avoided (Kuentcher).

In all of our cases fat embolus was observed only in thigh fractures.

Clinical symptoms (such as collapse of circulation or tachycardia) which are indications of a fat release were observed only in two cases of complicated thigh nailings. This may be explained by the fact that the "emergency valve" at the insertion spot becomes rather small with the thigh nailing because of the presence of the guide rod in the nail. As long as the marrow cavity is open at the fracture cleft it may suffice in general but this will not be true in old fractures in which the marrow cavity is closed by callus or connective tissue.

It was noted that technical difficulties may arise in all cases of marrow nailing. When these occur especially strong and repeated strokes are sometimes necessary to drive the nail in and these are transferred to the bone as the nail is forced into it. Prolonged striking on the bone may cause a release of marrow fat into the circulation (Larsen), and these "hard" strokes may show other dangerous effects. In order to prevent these dangers, the nail should be driven in by means of strong "long" strokes and it should be replaced by a thinner nail as soon as jamming occurs. In thigh fractures it is always better to use nails that are too thin than too long.

In addition to this the guide rod should be removed for some time after the insertion of the nail into the proximal marrow cavity to facilitate an easy outflowing of the compressed marrow.

In all thigh fractures it seems better not to perform a nailing operation when symptoms arise which are indicative of impending shock, or in patients in poor health, or where dangerous symptoms arise. After all, nailing is a major operative procedure and even a small displacement of fat may lead to a fatal termination as a consequence of injuries which already exist or which may arise during the operation.

SUMMARY

In fresh simple fractures the stabile osteosynthesis achieved by means of the marrow nail shows the following advantages:

In comparison to the conservative treatment the healing process shows much better results.

The time required for the treatment in the hospital and the duration of disability is considerably shorter.

The nursing of the patient is very much facilitated.

The danger of infection, the possibility of fat embolism, and damages due to metal are avoidable if the proper indications are followed, the correct technique used, and good asepsis observed under properly controlled conditions.

It must be kept in mind, however, that in fresh closed fractures a marrow nail operation should be performed only if that operation can be done without exposing the fracture site.

If the osteosynthesis achieved by the nail is only "relatively stabile" its advantages are still much greater in comparison to the conservative methods of treatment. The danger of infection and the danger of a late displacement are, however, considerably greater and therefore special consideration must be given to the after-treatment.

The contra-indications in the nailing of fresh simple fractures are: burns, blisters due to pressure on the skin, suppurating wounds, or other centers of infection in the body, shock, or poor general condition of health.

The method of choice is the *closed nailing* for all simple fractures of the femur between the lesser trochanter and 7 centimeters above the knee joint. Spiral fractures in the upper third and shaft fractures with a long spiral splinter may also be nailed (and in these cases an additional wire traction is not required). The nail, which should be long enough, must be inserted at the proper spot and an early weight-bearing must be avoided because the osteosynthesis is only "relatively stabile." In distally located spiral fractures, nailing offers no advantage and therefore it is better to abstain from nailing.

In leg fractures the nailing is particularly easy from the technical point of view but a true stabile osteosynthesis will be obtained only in transverse fractures, or short oblique, and in spiral fractures in the middle third.

Even in oblique and spiral fractures in the lower third one may obtain such a strong hold by means of the usual double nail that the application of an additional wire traction is not always indicated. In these cases the nails must be driven into the line of growth (epiphyseal line) and sometimes an additional plaster cast or a U-splint will be required. In these cases and in fractures in the upper third the osteosynthesis is only relatively stabile and therefore special attention must be paid to weight bearing and the patient carefully observed.

If the fibula has come to an early healing it should be resected without delay in order to prevent a blocking effect upon the formation of callus; particularly in those cases in which the nails are too short. In those cases the nails are to be kept in position.

Isolated fractures of the tibia are particularly suitable to the nailing method and weight bearing should be early.

The danger of a spreading of infection to the fracture cleft is rather imminent if the osteosynthesis is only relatively stabile. Therefore the contra-indications should be especially strict in leg fractures because of the imminence of infection. First of all fractures with considerable swellings of the soft parts, blisters, or injuries of the skin should be excluded from nailing.

The closed nailing is the method of choice also for simple *shaft fractures of humerus*. Fractures in the upper and middle third should be nailed proximally, fractures in the lower third, however, distally. Fractures which are less than 7 centimeters distant from the shoulder joint should be nailed from the middle part of the humerus. The nails must be driven into the humeral head and the inner nail should be somewhat S-shaped.

Fractures of the surgical neck of the humerus should be nailed only if it is not possible to fix the fragments and firmly press them together.

Isolated shaft fractures of the ulna and radius should be nailed, on principle, if they are distant enough from the joint ends. In these cases the bone ends must be thoroughly immobilized because of the jamming effect of the second bone.

If both forearm bones are broken they should be nailed only if the fragments cannot be fixed and firmly held together by means of a plaster cast. It is suitable to nail both bones.

If an infection occurs the wound must be opened widely and the limb immobilized until the acute symptoms have subsided. If the osteosynthesis is relatively stabile the cast may be removed when the wound has come to an aseptic healing or when the fracture is bridged over by bone, otherwise an infection of the fracture cleft may occur. In such a case the nail should be removed only after the healing of the fracture.

If after the extraction of the nail an infection occurs, the limb must be immobilized in such a way that the area of nail insertion is at the dependent point, otherwise a gravity abscess may occur at the fracture cleft.

To be continued in July-August issue of the MEDICAL BULLETIN.



Vagus Neurectomy in Peptic Ulcer

Analyses of 60 Cases

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VAGUS neurectomy as a surgical procedure in the treatment of peptic ulcer was first performed by the authors in February 1947. For several months prior to this time there had been some pressure from the medical service to use the operation. A few patients even had asked why we weren't performing the "new nerve operation." Nevertheless, the writers were reluctant to try the procedure despite the excellent results reported by Dragstedt (1), Moore, Grimson, and others, because we were convinced that partial gastrectomy was an excellent operation for the cure of both gastric and duodenal ulcers. However, the authors were well aware of the difficulties and dangers that are encountered in attempting to resect a large penetrating ulcer of the posterior wall of the duodenum, i. e., possibility of injury to the common bile duct, of blown out duodenal stump, duodenal fistula, and peritonitis. It was in just such a case that we performed a vagus neurectomy for the first time. The patient was an obese middle-aged man who had complained of pain for six years and had had several episodes of moderate bleeding. The pain had failed to respond to medical management. A large ulcer of the posterior wall of the duodenum, which had penetrated into the pancreas was found at operation. Resection of the ulcer was considered dangerous and rather than perform a gastrojejunostomy or a Finsterer type of partial resection a vagus neurectomy was done. During the next six weeks this operation was performed on four or five poor risk patients. The immediate results in these cases were so good that the writers were encouraged to extend the use of the procedure. It soon was found necessary to combine gastrojejunostomy with vagus neurectomy in a large percentage of cases. Our good results with this operation in 60 patients have pleased us. We consider vagus neurectomy or vagus neurectomy plus gastro-enterostomy as the operation of choice in the surgical treatment of duodenal ulcer. The patients, as a group, are happy and enthusiastic because of the relief of their symptoms.

There is at this time considerable controversy and confusion regarding the efficacy of vagus neurectomy, the indications for it, and the place the procedure will eventually occupy in the treatment of peptic ulcer. A review of the authors' experiences in 60 cases is presented in which vagus neurectomy, either performed alone or in conjunction with some other surgical procedure, has been employed in the treatment of peptic ulcer.

TECHNIQUE

In all cases, the vagus nerves are cut subdiaphragmatically. This is a simple procedure, and one in which there is the added advantage of visualizing the lesion; thus the surgeon can better evaluate the condition. Through a left pararectus, muscle splitting incision, the peritoneum is opened from the xiphoid-costal junction to the umbilicus. The left lobe of the liver is mobilized by cutting the ligaments and then retracting it medially. This exposes the diaphragm and the esophageal-cardiac junction. The peritoneum about this area is incised and with sharp and blunt dissection, the esophagus is mobilized and drawn downward by means of a Penrose drain placed about the gastro-esophageal junction. The nerves are readily palpated, isolated, dissected free, and excised generously; there has been no difficulty in finding them. The right or posterior vagus nerve is usually much larger than the left or anterior vagus nerve. A careful search is made for accessory nerve fibers, and all suspicious bands are cut. The lobe of the liver is then replaced without attempting to repair the triangular ligament and the abdomen closed in the usual manner without drainage. In over one-half of our patients, many of whom had partial or complete pyloric obstruction, and some in whom we feared that the healing of a large ulcer would cause stenosis and obstruction, a posterior gastrojejunostomy was performed.

POST-OPERATIVE TREATMENT

According to the suggestions of Dr. Dragstedt (1), continuous gastric suction was used in all cases for 4 days. Parenteral feedings of water, dextrose, physiologic saline, amino-acids, supplemented with blood or plasma have been given as indicated. After the tube is removed and fluid oral feeding started, gastric lavage is carried out morning and evening to prevent the stomach from becoming over-distended and atonic; however, few of our patients have been troubled by the retention associated with a large dilated stomach. As soon as the stomach lavage shows little or no residue, progress from soft diet is rapidly attained and, usually within two weeks after their operation, patients can eat or drink anything they desire. Food preferences are not restricted and it is a revelation what the patients can

eat or drink and enjoy. Most of them eat foods that they avoided for years and to their great joy and satisfaction, have no untoward results.

The authors have carried out post-operative studies such as gastro-intestinal series, gastric analysis, and insulin tests, as suggested by Hollander. Free acid has been negative and combined acid low in almost all of our cases. Because of the severe symptoms caused by the insulin test, it has not been performed in the latest cases. The excellent clinical results obtained by vagus neurectomy have led us to believe that this severe test is unwarranted. In the vast majority of our cases, there has been only slight delay in the emptying time of the stomach.

In this report the facts are tabulated in 60 cases of ulcer which have been treated by vagus neurectomy. Patients were referred for surgery from the combined medical and surgical gastro-intestinal clinic of this hospital. For the most part, they were medical failures who had the usual requirements for surgical intervention; such as, non-response to prolonged medical treatment, repeated hemorrhages, and the pyloric obstruction. Most had been treated medically for years. Some were so troubled with pain that they demanded surgery.

Types of ulcers and number of patients with each type were as follows: Duodenal, 52; gastric, 6; and marginal, 2.

The patients' ages ranged from 21 to 62 and the duration of their various symptoms ranged from 1½ to 27 years. There were 31 patients in whom pain was the only symptom; 2 who had bleeding alone; and 27 who had both pain and bleeding. Eleven of the 60 had pyloric obstruction ranging from partial to complete.

The age of the patients by decades was as follows: 20-29, 7; 30-39, 16; 40-49, 10; 50-59, 23; and 60-69, 4.

TYPE OF OPERATION

The technique of the operation has been described. Gastro-enterostomy was not performed in all patients at the time of vagus neurectomy. The decision to perform an anastomosis was determined by the pre-operative gastro-intestinal series, the findings at operation and the judgment of the surgeon. If the roentgenogram showed obstruction, usually a gastro-enterostomy was performed. If a large ulcer which could produce stenosis of the duodenum upon healing was found a side-tracking procedure was performed. To date no secondary so-called drainage operations have been necessary to aid the emptying of the stomach.

Vagus neurectomy was performed on 19 patients; vagus neurectomy and posterior gastro-enterostomy on 39; and vagus neurectomy and anterior gastro-enterostomy on 2.

POST-OPERATIVE COMPLICATIONS

There were comparatively few post-operative complications. Atelectasis of one or more lobes or the lungs was the most frequent. It occurred in 13 or 21.6 percent.

Dehiscence with or without evisceration occurred in 4 or 6.6 percent, with one death. Bronchopneumonia occurred in 4 (6.6 percent). Gastric retention occurred in 10 patients (16.6 percent). This retention ranged from moderate to mild and was judged from the amounts obtained by the morning and evening gastric lavage and from post-operative gastro-intestinal roentgenography. In no case was it distressing or of concern to the patient. The complaint heard most often was that some of the patients felt a bit bloated. There were three patients (5 percent) who had intermittent eructations of foul gas. One patient had such relief following his operation that he was completely satisfied with the result, notwithstanding the odor. None had diarrhea. Most patients did very well, many of them gaining from 10 to 40 pounds in 3 to 4 months.

MORTALITY

There were two deaths, a mortality of 3.3 percent. One of these was due to an incompatible blood transfusion, proved by autopsy. The other also believed due to a blood transfusion reaction occurred after a stormy post-operative course, complicated by dehiscence, anuria, and a rising nonprotein nitrogen. Autopsy was not done.

GASTRIC ACIDITY

In general the findings were the same as those reported by most observers. The cases of duodenal ulcer had high free and total acids and the range in gastric ulcer cases was much lower. Vagus neurectomy in most cases reduced the acidity reading to no free acid. As previously stated the Hollander test was not done on all patients but on those that it was done, the values gave a flat curve in a high percentage of cases.

POST-OPERATIVE GASTRO-INTESTINAL SERIES

Many advocates of gastrectomy in the treatment of peptic ulcer claim that it is necessary to remove the ulcer in order to cure the disease. All surgeons do not accomplish this. In some series, according to Lewisohn (5) as many as 35 to 75 percent of ulcers are not removed, presumably because of the dangers encountered in attempting their removal. Many critics of vagus neurectomy claim that not removing the ulcer is undesirable, that it does not heal and that it is always a threat to the patient's health and well-being. To

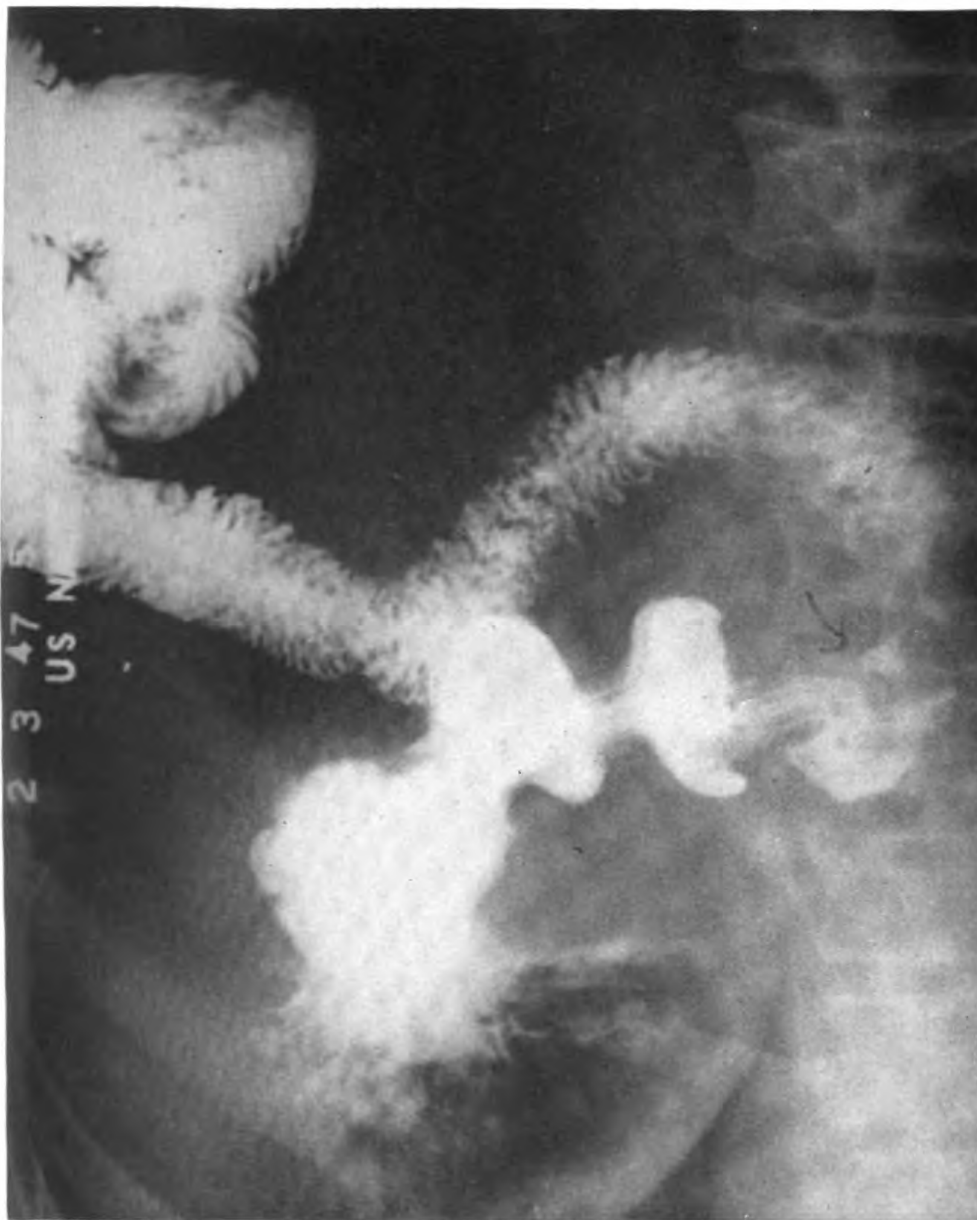


Figure 1.—3 February 1947, a well-formed cap with ulcer crater is shown. Note location of ulcer on descending portion of duodenum.

ascertain whether or not this was true, all patients were examined post-operatively by gastro-intestinal roentgenography (figs. 1, 2, 3, 4, 5, 6, and 7). Not all showed comparable roentgenograms. Others, because of the recent gastro-enterostomies, did not show filling of the duodenum, so no conclusions could be drawn. Because of these and other factors, only 30 of the 60 cases were comparable for evidence of ulcer healing.

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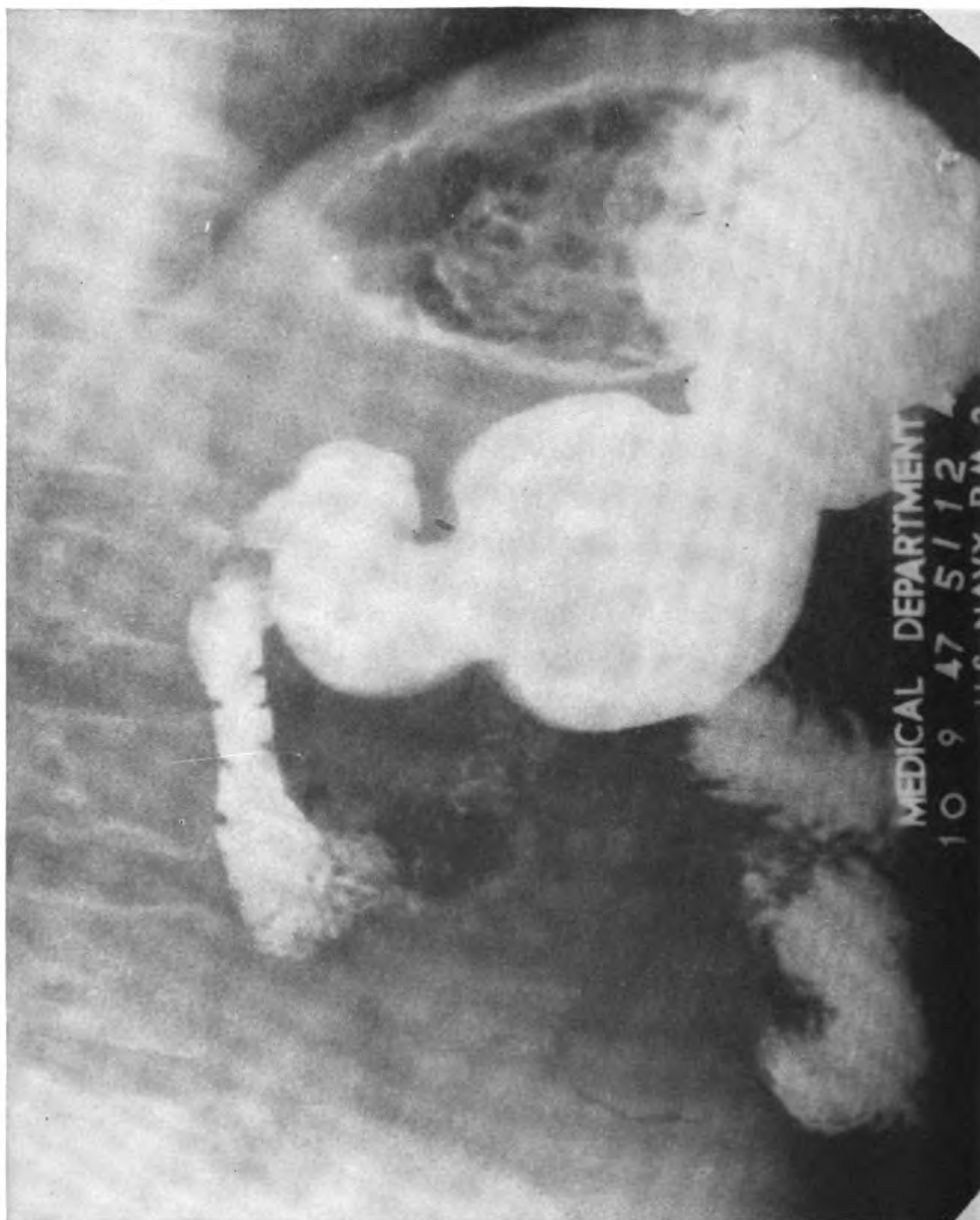


Figure 2.—Taken on 9 October 1947, 8 months later. There are no ulcer craters visible; there is a slight deformity of the duodenum, but improvement over original state is evident.

TABLE 1.—Roentgenographic evidence of healing post-operatively

Total cases	60
Total cases with comparable pre- and post-operative roentgenogram	30
Total number healed	26
Total number not healed	4

Of the four who were not healed, one was an inoperable malignant gastric ulcer. Vagus neurectomy was performed for pain with highly

successful results. In the other three, the clinical results were so good that we believe that later studies will prove that the ulcers are healing or healed.

COMPLICATIONS

Deaths.—Mortality 3.3 percent. One of the two deaths was avoidable and the other may have been. The first death, although all precautions were taken, was caused by a transfusion of incompatible

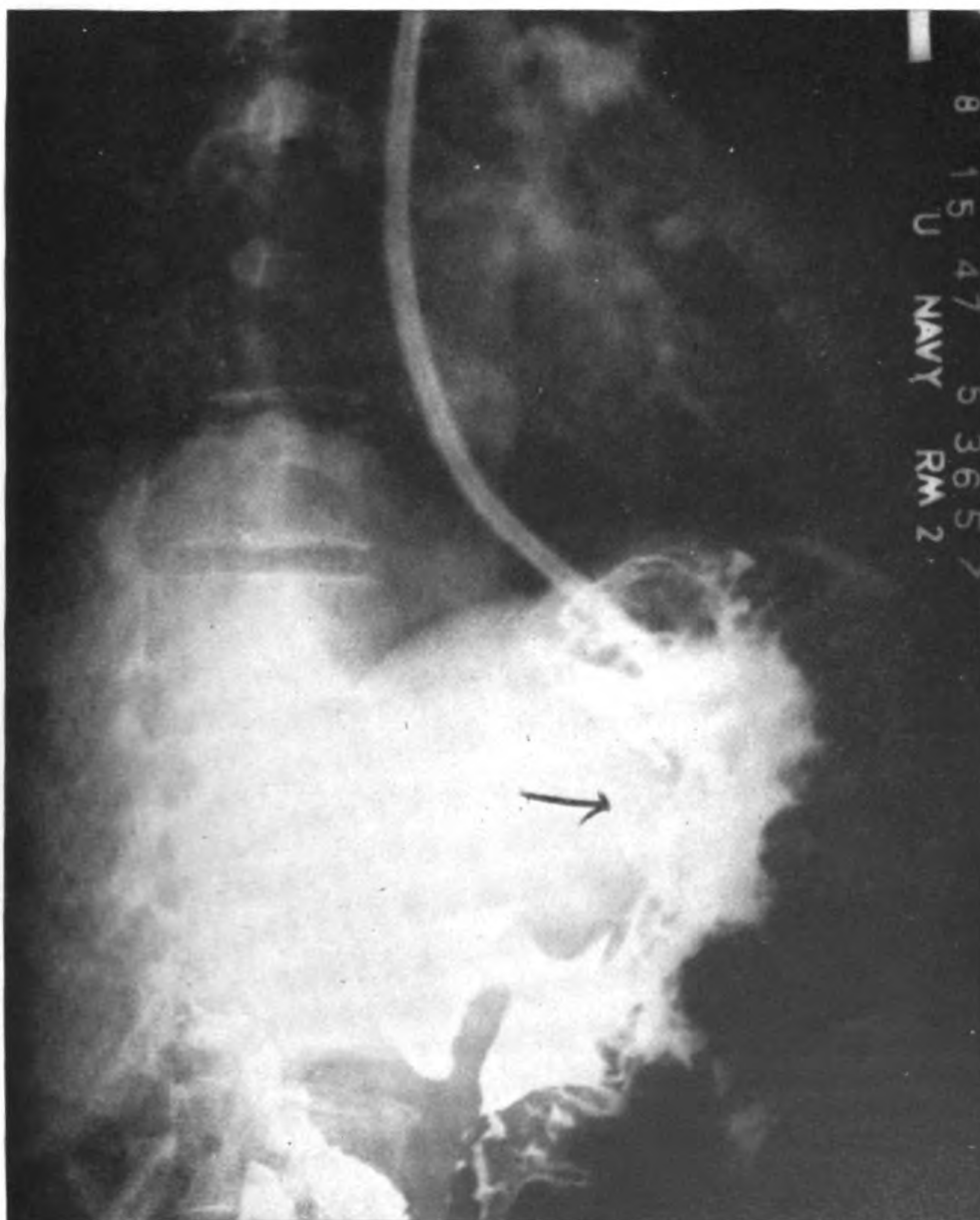


Figure 3.—Roentgenogram taken a few days post-operatively shows the large ulcer with arrow pointing out the deepest part of the crater.

blood. Post mortem examination confirmed the diagnosis. The second case was similar, having uremia and a rising nonprotein nitrogen. Unfortunately permission for autopsy was refused.



Figure 4.—Roentgenogram taken slightly over a month later, shows complete disappearance of crater and some stenosis of stomach, suggesting hourglass formation. This was associated with clinical improvement.

Atelectasis.—21.6 percent. This incidence seems high. Preventive measures were followed. Early ambulation was practiced, but apparently with the high incision and the manipulation of the diaphragm,

coughing was impaired. The incidence was no higher than for other upper abdominal operations in adult males. All our patients were males.

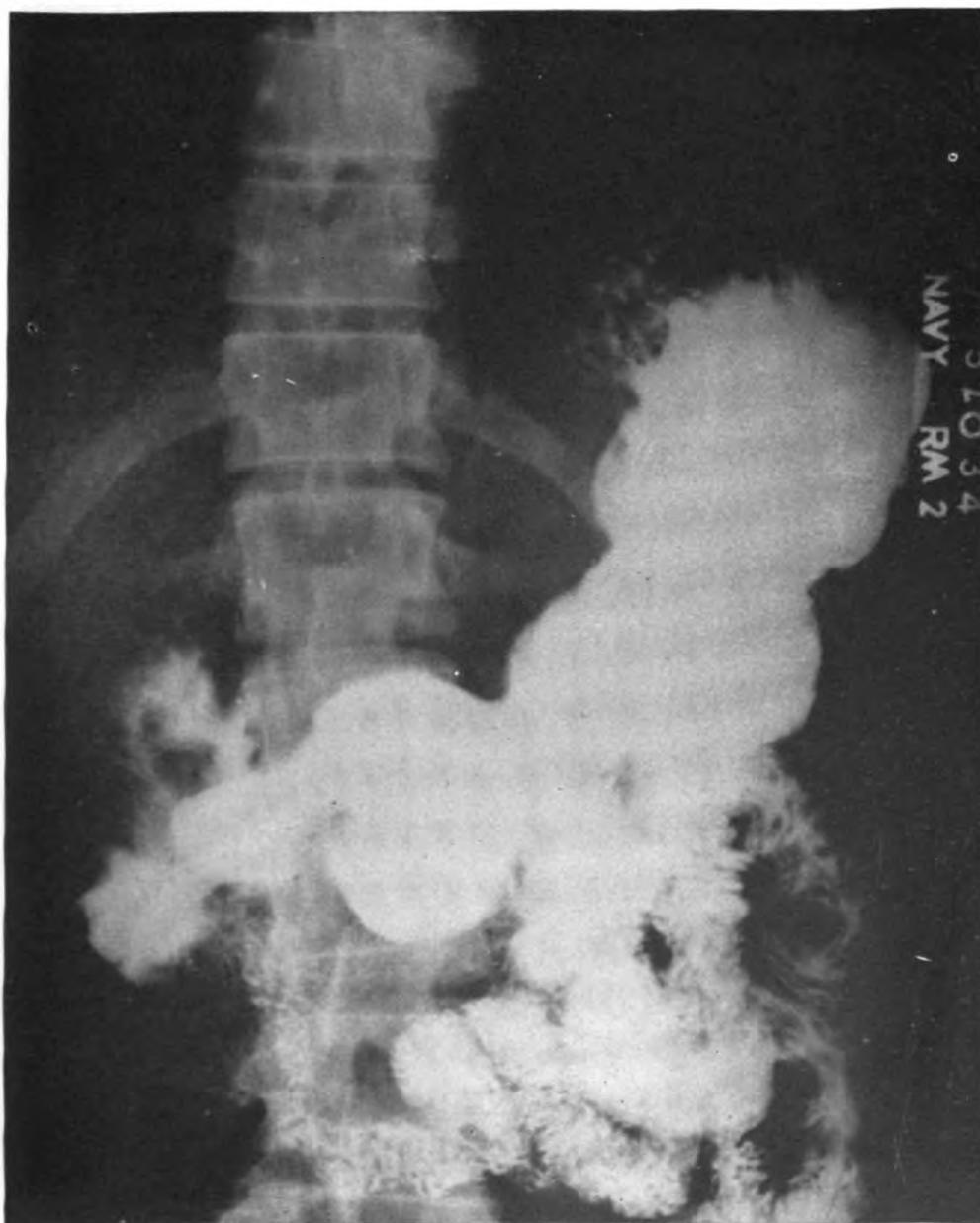


Figure 5.—Roentgenogram shows pre-operative deformity of duodenum with crater formation.

Gastric retention.—Most patients had some delay in emptying. The majority had little or no six-hour retention. Some had prolonged emptying for as long as 24 hours. Two patients on whom gastroenterostomy was done showed slight 24-hour retention, on roentgeno-

gram. One had symptoms for 18 days post-operatively, the roentgenogram showed no passage of barium, and much concern was caused by the thought of some technical error causing obstruction. However, emptying finally took place and in the last roentgenogram taken more than one year later, slight 24-hour retention was present. The other patient has never had any untoward symptoms correlated with the delayed emptying.

Gaseous eructations.—Three patients complained of this, one intermittently and mildly, the other two more regularly and moderately. This complication is certainly a disadvantage to the operation and it is possible that it could be controlled by intermittent gastric lavage

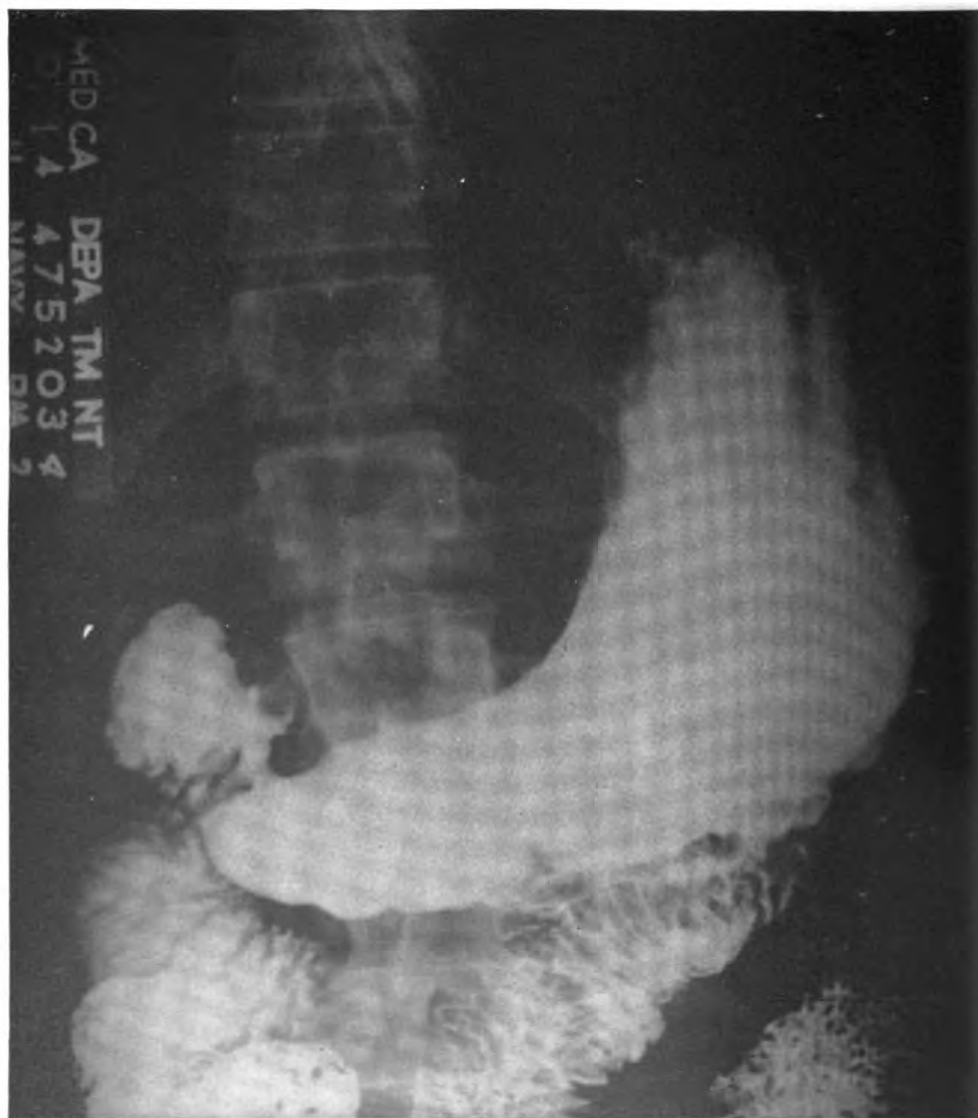


Figure 6.—Roentgenogram taken 3 weeks post-operatively shows healing of ulcer although still present. The outline of the duodenum shows marked regression to normal.



Figure 7.—A 4-hour film taken 2 months post-operatively demonstrated complete emptying of stomach.

or the addition of dilute hydrochloric acid to the diet. Oddly enough, all these patients are highly satisfied with the results of their operation. Of the two that had moderate attacks, one cleared up spontaneously after six months; the other patient was improved by adding dilute hydrochloric acid to his diet; the third still has mild attacks.

Gastric ulcer.—Most surgeons agree that marginal ulcer is the primary type of case for which vagus neurectomy is the operation of choice. Duodenal ulcer is the one for which Dragstedt (2) recommends vagus neurectomy. In the majority of cases, gastric ulcer

should be treated by partial gastrectomy because of the danger of the lesion being malignant. Perhaps a word is indicated in explanation of six patients with gastric ulcers who were treated by vagus neurectomy.

Case 1: This patient had an inoperable cancer of the stomach and had had a partial gastrectomy performed some years previously for duodenal ulcer. Vagus neurectomy was done to relieve his pain; it was successful. He later died of cancer.

Case 2: This patient was an emaciated male who had tuberculosis and a huge long-standing gastric ulcer. If it were malignant, its age and size argued against a cure.

Case 3: A 42-year-old man, who was a cyclic alcoholic and had a gastric ulcer, which had been visualized by gastroscope and by roentgenogram. Healing of the ulcer was seen on the roentgenogram and by gastroscopy.

Case 4: A middle-aged man who was known to have had a painful gastric ulcer for years. Clinically the ulcer was not suggestive of malignant change. It may not have been prudent, but vagus neurectomy was performed, and the pain was relieved immediately. He had had a gastro-enterostomy performed years before. The ulcer healed in eight days, as shown by roentgenography.

Case 5: This patient was an elderly male who had had a long history of ulcer pain and known gastric ulcer. He was a poor operative risk and in poor nutrition because of the ulcer. There was no evidence of malignancy other than the presence of the lesion in the stomach. Vagus neurectomy was performed as the less dangerous of two operations.

Case 6: This patient previously had had massive hemorrhage. A gastro-enterostomy had been done at another hospital for what was thought to be an ulcer on the lesser curvature. Gastrectomy was planned, but as the operation started, he went into a state of collapse. Gastrectomy was abandoned and vagus neurectomy was done: broad local excision of the ulcer was performed to end the hemorrhages. The pathologic report proved that it was a benign ulcer.

RESULTS

Excluding the 2 patients who died, only 3 of the other 58 had poor results or complained. Two of the three had rapid healing of the ulcer by roentgenographic examination, and had low free and total acids and flat curves with the Hollander test. One complained vaguely of pains which were different from his ulcer pains. Another had pain and vomiting, but when ordered to show a specimen of his vomitus to one of the staff, his vomiting ceased abruptly. He still complains of vague pains in the right lower quadrant of the abdomen. His weight is above his pre-operative mark. The third had immediate relief from pain following his operation, but the post-operative gastric analysis and Hollander test were not typical of vagus neurectomy. One month later he again had severe pain, and 2 months later had a severe gastrointestinal hemorrhage. Gastrectomy was performed; at operation the region of the esophageal-stomach junction was explored for accessory nerves, even though two definite nerves were found at

the previous operation. Two strands were found and the pathologists reported them to be sympathetic nerve fibers. Post-operatively, he did well except for dehiscence. He made a full recovery.

SUMMARY

1. Sixty patients with peptic ulcer were treated by vagus neurectomy; 58 survived the operation. The results obtained in this series of 60 patients were as follows: Excellent, 46; good, 9; and poor, 3.

2. Patients with peptic ulcers treated by vagus neurectomy have low gastric acidity, their ulcers heal, and the pain is relieved.

Since this article was written, 23 additional patients were treated by vagus neurectomy with the same general results and no deaths.

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Chronic Nonspecific Jejunitis

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IN 1932 Crohn, Ginzberg, and Oppenheimer (1) published their classical work on nonspecific inflammatory disease of the small intestine, chiefly the terminal ileum, calling the condition "regional ileitis." Shortly after this report was published it was found that these nonspecific inflammatory conditions need not be confined to the ileum or cecum, but that they also occurred in the jejunum alone or in conjunction with other lesions of similar nature. Harris and his coworkers (2) reported the first case in which there was primary jejunal involvement and suggested that the term "enteritis" be substituted for the more restrictive term "ileitis." A year later Brown, Bargen, and Weber (3) reported that 3 of their 18 cases of regional enteritis involved only the jejunum. In 1940 Browne and McHardy (4) found 600 cases of ileitis, in which the jejunum was involved in 20, mentioned in the literature up to that time, and found no instance of nonspecific regional jejunitis in more than a million hospital admissions, and 8,000 post mortem examinations. Two years later Brown and Donald (5) reported a total of 5 primary jejunal lesions occurring in 178 cases of regional enteritis. From this evidence, it may be seen that regional jejunitis, or more accurately, nonspecific regional jejunitis, occurs with one-twentieth the frequency of regional ileitis, and in fact is a rare disease.

Since 1942 several investigators (6) (11) have reported single cases of regional enteritis involving the jejunum alone, but unfortunately, they have been unable to arrive at any conclusions as to the characteristics of the disease or the most beneficial type of treatment. The present report concerns 3 patients who were studied at the U. S. Naval Hospital, Long Beach, Calif., and in which a diagnosis of chronic nonspecific jejunitis was proved at operation. With these cases and the cases reported by other writers, we have attempted to outline some of the characteristics of this disease, although it is admitted that there are still too few cases on record for any direct conclusions to be drawn.

CASE REPORTS

Case 1.—C. L., a 41-year-old white male, entered the hospital on 9 May 1946 complaining of fatigue, anorexia, and left flank pain of 1 week's duration. He had not been entirely well for the past 2 years. He had had anorexia and nearly monthly attacks of cramping, squeezing pain which would begin at the umbilicus and move to the left flank and then back to the epigastrium. This pain was made worse by eating and relieved by antacids. There had been no nausea, vomiting, loss of weight, diarrhea, or melena, but he stated that his stools were usually quite loose. One month prior to admission he began to have projectile vomiting. He was unable to eat or drink any food without nausea or



Figure 1.—Roentgenogram following barium meal.

vomiting for 2 weeks before admission. These symptoms subsided with a bland diet and supportive therapy.

Physical examination revealed a fairly well nourished middle-age white male who appeared tired and listless. The blood pressure, temperature, pulse, and respirations were normal. There was slight tenderness in the left upper quadrant of the abdomen diminishing toward the flank. Routine laboratory examinations, including complete blood counts and urinalysis were normal. The blood Kahn test was negative and the sedimentation rate was normal. The stools showed 1 plus blood on several occasions and were persistently negative for ova and parasites. The gastric analysis showed almost a complete achlorhydria. Otherwise the physical examination was essentially negative.

On 24 May 1946 a barium meal was given and tenderness was noted over the upper left abdominal quadrant. Roentgenography showed spasticity, irritability, and segmentation of the barium meal in the jejunal area (fig. 1). The normal mucosal pattern of the jejunum was disturbed and replaced by generalized haziness.

On 8 June 1946 an exploratory operation was done. The proximal 2½ feet of jejunum was thickened, dusky, and there was loss of luster of the serosa. Many enlarged lymph nodes were present in the mesentery; two were taken for microscopic examination. The remainder of the intestine and the other abdominal organs showed no abnormalities. A long loop, anterior contraperistaltic gastro-enterostomy was constructed and the abdomen closed. The post-operative course was uneventful, and 1 month later the patient was asymptomatic although he was still on a bland diet. Biopsy of the lymph nodes revealed only chronic inflammation. Recent follow-up showed that the patient had gained weight, was symptom-free, and was on a practically unrestricted diet.

Case 2.—W. S., a 22-year-old white male entered the hospital on 13 March 1946 complaining of pain in his abdomen and diarrhea of 1 week's duration. He stated that he was well until a week prior to admission when a moderately persistent diarrhea developed with generalized abdominal pain which settled to the lower right quadrant. His appetite had been poor. Otherwise, the past history was noncontributory.

Physical examination: The patient was a well-developed, well-nourished white male complaining of some abdominal distress. The temperature, pulse, respirations, and blood pressure were all normal. The urinalysis and blood Kahn test were negative, red blood cells, 4.8 million; hemoglobin, 14 gm.; and white blood cells, 12,400, with 60 percent leukocytes. There was extreme lower right quadrant tenderness without rigidity.

Pre-operative diagnosis: acute appendicitis. A normal appendix was found and removed at operation.

Two days post-operatively the patient complained of epigastric pain and persistent vomiting. The abdomen was soft except in the epigastric region where some tenderness and rigidity were noted. His temperature was 100.0° F. It was thought that he might have had early peritonitis, but further observation showed that he had subacute gastric distention. During this time he was receiving only fluids by mouth, usually tolerating only water.

On the sixth post-operative day he was given a small amount of barium by mouth. The stomach filled in normal position but was somewhat atonic and dilated. There was slight pylorospasm, but barium passed through the pylorus within 30 minutes after ingestion. Serial films showed dilatation and some distention of the third portion of the duodenum with evidence of obstruction. A small amount of barium passed through the duodenum at the end of 4 hours, and appeared in the small intestine in a very small amount (fig. 2).

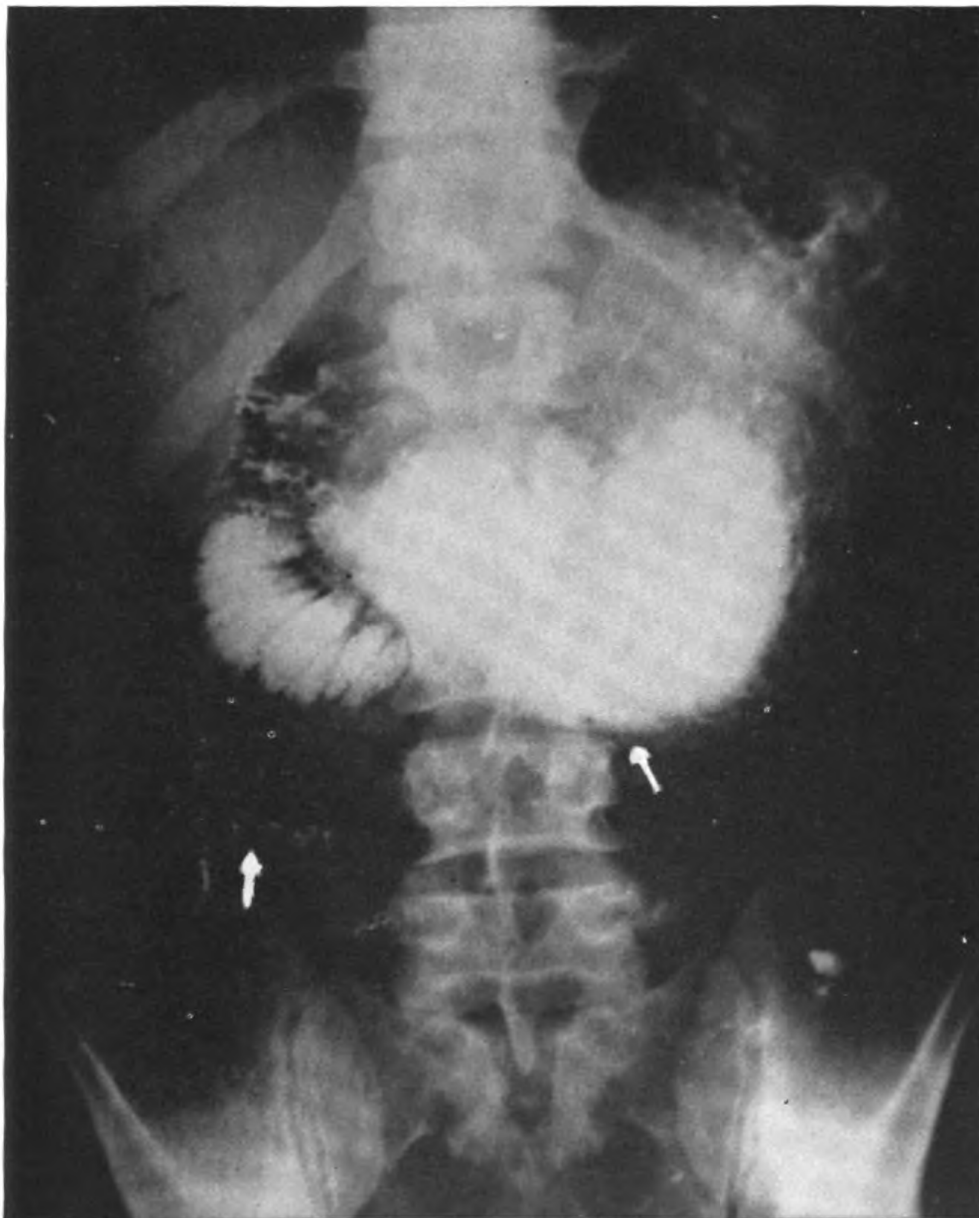


Figure 2.—Roentgenogram of barium meal 4 hours after ingestion.

On 26 March 1946 an exploratory operation was performed and the duodenum at its point of exit from its retroperitoneal position was found to be kinked and held to the right for a distance of 3 inches. There was also a kink in the jejunum held by adhesions. The terminal duodenum and proximal 18 inches of jejunum had thickened, dusky walls and many lymph nodes (some a centimeter in diameter) were in the mesentery. No other abdominal pathologic condition was noted. A lymph node was removed for biopsy, the adhesions freed, and an anterior long loop gastro-jejunostomy was made.

During the patient's immediate post-operative period he developed slight pneumonitis, but under therapy this subsided. Thereafter he rapidly gained in weight and strength and had no complaints. The pathologist reported lymphadenitis with no evidence of primary lymph node involvement.

Case 3.—J. S., a 31-year-old white male was admitted to the hospital on 3 March 1946 complaining of intermittent, generalized, vague abdominal pain of 5 weeks' duration. During this time there had been episodes of nausea unrelated to ingestion of food, but no vomiting. He had had some anorexia but no unusual loss of weight. There had been numerous episodes of loose, watery stools, and on two occasions he had noticed a small amount of bright red blood in the stool.

Past and familial histories were noncontributory.

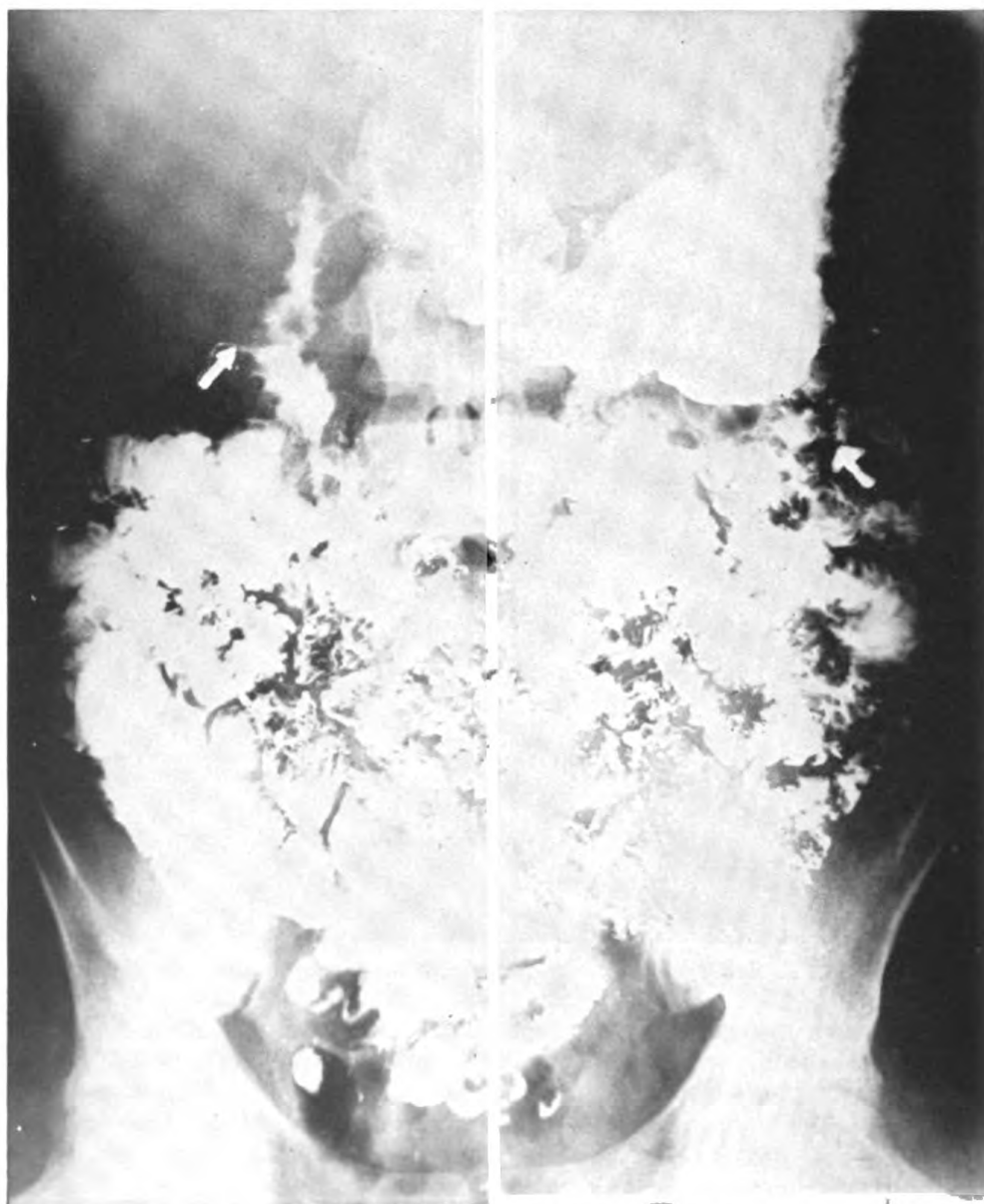


Figure 3.—Roentgenogram of barium meal 30 minutes following ingestion. The arrow points to the narrowed and spastic duodenum. Another arrow points to the persistent deformity along the greater curvature of the stomach in the fundal area.

Physical examination revealed a well-developed, well-nourished white male who did not appear acutely ill. The temperature, pulse, respirations, and blood pressure were all within normal limits. The blood count, urinalysis, and blood Kahn test showed nothing abnormal except a moderate hypochromic anemia. There was tenderness to pressure along the ascending and transverse colon. There was some muscle guarding over the right upper and lower quadrants, but no rebound phenomena, and no definite localization of tenderness in the right lower quadrant. The tenderness was most marked over the area of the gallbladder.

The vague pains were partially alleviated by a smooth diet, but the diarrhea persisted, and stools occurring about 4 times a day often contained clots of blood. A sedimentation rate (Wintrobe) was 8 mm./hr. Several stool specimens revealed no ova or parasites. A gallbladder series was negative.

On 27 March 1946 a gastro-intestinal series was done which showed a persistent deformity along the greater curvature of the stomach in the fundal area, suggestive of extrinsic pressure. The duodenal bulb filled without evidence of deformity or irritation. The descending portion of the duodenum appeared narrowed and spastic. Hypermotility was noted in the passage of the barium through the upper small intestine. Tenderness was noted in the abdominal area immediately below the fundus of the stomach. A 30-minute progress film showed an abnormal small bowel pattern with increased motility of the barium meal which appeared in the ascending colon at that time (fig. 3).

On 14 April 1946 an exploratory operation was performed. The entire jejunum from the ligament of Treitz to the ileum was found chronically inflamed but without evidence of obstruction; the wall was thickened and dusky. The mesenteric lymph nodes were enlarged, but no other abdominal pathologic changes were noted. A posterior gastro-enterostomy was performed without resection of the jejunum.

The post-operative course for the first 4 days was fairly smooth. During the next 5 days, however, the patient developed increasing signs of intestinal obstruction. On 24 April 1946 he was operated on again. Dense adhesions were found about the old incision, and an obstructing band was found in the jejunum 5 cm. proximal to the gastro-enterostomy and released. An entero-enterostomy was performed joining the afferent and distal loops about 10 cm. from the former gastro-enterostomy site.

The post-operative course, this time, was stormy; the wound disrupted on 30 April 1946 and was resutured. A jejunostomy was done at this time.

Following this the patient made rapid progress toward recovery; the diarrhea stopped, pain disappeared, and he began to have an appetite and to put on weight. The jejunostomy was closed on 31 May 1946. The gastro-enterostomy was functioning well. He was discharged from the hospital and a 4-month follow-up revealed that he had gained considerable weight, had a good appetite, and felt well.

DISCUSSION

Incidence.—Chronic nonspecific jejunitis, like regional ileitis, is predominantly a disease of young adult males, although any age group may be affected. It apparently is rare in females as no cases cited in the literature were in females. The average age of onset in the three cases reported in this article was 31 years, and of all cases reported in the literature the average age was 29.5 years. Of 10 cases (including our 3) 8 were white, 1 Chinese, and 1 Negro.

The disease is a relatively rare condition in comparison to other forms of regional enteritis. Rieben (12) reported that it occurred in 4 percent of the cases of regional enteritis. Browne and McHardy (4) found it occurred in 18 in their study of 600 cases of regional enteritis. Crohn and Yunch (13) in their discussion on ileojeunitis, an allied disorder, found 17 cases of this disease in 200 cases of regional enteritis, and it appears that primary jejunitis is even more rare.

Etiology.—The cause of this disease is unknown and many theories have been presented to account for it. Jejunitis has been thought to be a manifestation of a subvariety of sprue because of the similar pathologic findings in this disease and in acute or subacute jejunitis (14). Attempts to culture the organisms of tuberculosis, dysentery, or other enteric organisms have failed. The virus of lymphogranuloma venereum has been considered to be the causative agent, but Frei tests practically always have been negative. Reichert and Mathes (15) suggested that the disease may be the result of infected lymphatic channels. Sinaiko and Nechelis (16) were able to produce changes in the bowel wall similar to those found in regional jejunitis by injecting sclerosing solutions into the lymphatic channels. However, they concluded that these changes might be due to obliteration of the blood supply because of the technique used. It seems more likely that changes observed in the adjacent mesenteric lymph nodes are the result of disease in the bowel wall and not the cause.

On the basis of the pathologic findings in a case of jejunitis, Koenig (9) suggested that the disease may be a variety of sarcoidosis, but he was unable to find any proved cases of sarcoid involvement of the intestinal tract.

Pathology.—At operation, the affected jejunum generally appears hyperemic, dusky, thickened, and varying degrees of lymphadenopathy may be seen in the adjacent mesenteric lymph nodes. The amount of involved jejunum varies; in some cases the entire jejunum from the ligament of Treitz to the ileum may be affected; or there may be segmental affection with so-called "skip areas" as in the case described by Johnson (7). The duodenum may be affected in part as was the case in one of our patients. In later stages, obstruction, obliteration of the intestinal lumen, and even fistula formation, as in Gendel and Beaver's (10) patient, may occur. Indeed, the pathologic picture seems to follow the chronicity of the disease much the same as Crohn described in his original article concerning the pathology of regional ileitis in 1932. The approximate stage of the disease may be determined on evaluating the history and findings.

Microscopically, the affected jejunum shows varying amounts of chronic inflammatory cells, giant cells, eosinophils, thickening and hypertrophy of the muscular walls, edema, and replacement with

fibrous tissue, occasional thickening of the serosa, and varying degrees of ulceration of the mucosa.

In nearly all cases, lymph nodes taken from the adjacent mesentery show only nonspecific hyperplasia with inflammatory changes.

Symptomatology.—Generally the patient with chronic nonspecific jejunitis is a young adult male of no specific race. The history is one of gradually increasing abdominal pain, nausea, and vomiting, often diarrhea, lassitude, and weight loss, and usually a low-grade fever extending over a period of several months. Sometimes these symptoms occur for 2 or more years, but in one of our cases the duration of symptoms was only 1 week; usually the duration of symptoms is from 1 to 3 months, with a history of some sort of stomach disorder varying from mild indigestion to actual cramping pains during the preceding years.

The pain is usually dull, intermittent, and cramping, located most often in the epigastrium, although it may occur in the lower abdominal quadrants. It either may be relieved or made worse by eating. Not infrequently the patient will complain of a bloating sensation after meals. The pain is usually progressive, may at first respond to antacids, but later becomes intractable.

Vomiting is the rule, usually associated with nausea and is often projectile in nature. Diarrhea is common, often associated with melena. In long-standing cases constipation may be a complaint due to partial intestinal obstruction. There is usually a persistent anorexia and lassitude, not uncommonly seen in chronic diseases. Clubbing of the fingers often occurs. Weight loss is always present and may be considerable. The patient may complain of low-grade fever and chills and increasing fatigability. He may say that he has noticed a moving mass in his abdomen when he was having the cramping pains.

Diagnosis.—In any patient complaining of gastro-intestinal distress, anorexia, nausea and vomiting, diarrhea, low-grade fever, and loss of weight of several months' duration, the diagnosis of chronic nonspecific jejunitis should be considered. The symptoms of this disease are not unlike those found in the regional enteritis of the ileum as described by Crohn.

There is usually a moderate but not severe anemia and leukocytosis may or may not be present. In one of the reported cases a persistent eosinophilia occurred; often the sedimentation rate is elevated. Achlorhydria may be present. An abdominal mass sometimes may be palpated. Occult blood may be found in the stool or gastric contents. The blood urea nitrogen may be abnormally high and total proteins low.

The radiological examination is of great help. In cases of jejunitis, there is often delay in the passage of barium from the duodenum if obstruction exists in the jejunum. In chronic cases the "string sign" of Kantor (17) may be noted. In most cases without obstruction however, there is hypermotility of the barium meal through the diseased segment, and loss of the normal "herring-bone" pattern caused by the diseased jejunal mucosa. Multiple strictures or "pipe-stem" loops may be observed (14).

Tuberculosis, syphilis, actinomycosis, amebic or parasitic diseases, carcinoma, lymphosarcoma, Hodgkin's disease, sarcoma, and deficiency states such as sprue, must all be considered and ruled out.

Treatment, course, and prognosis.—Treatment is surgical. The patient may be treated conservatively for some time. Which surgical procedure is best to use is a debatable question. Most of the reported cases have been treated by resection of the diseased segment of jejunum and primary anastomosis with reportedly good results. Lyons and Garlock (11) performed a duodenojejunosomy after transection of the jejunum below the diseased portion, leaving a blind loop of jejunum, and apparently obtained good results. In our cases, anterior gastro-enterostomy was done in 2 patients, and posterior gastro-enterostomy was performed in 1 patient.

Follow-up studies of our patients have shown them to be symptom-free since operation. It is doubtful if the disease has been cured, because even in resected cases, there is the possibility that the disease will occur in other segments of bowel.

SUMMARY

1. Chronic nonspecific jejunitis, a variety of regional enteritis occurs with approximately one-twentieth the frequency of "regional ileitis." Ten cases have been reported in the literature since 1940. The author could find only one case reported prior to this.

2. Three patients with chronic nonspecific jejunitis were treated surgically by an exclusion operation without resection of the diseased jejunum.

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Recurrent Acute Pancreatitis

Review of the Literature and Report of a Case

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RECENT literature has pointed out that the incidence of acute pancreatitis is much greater than was formerly believed. Comfort and Osterberg (8) report an estimated average of 20 cases per year at the Mayo Clinic.

Attacks of the disease are usually dramatic, rarely mild. They almost always present a picture of recurring pains in the upper abdomen and some dysfunction of the secretory acini or islet cells of the pancreas. Certain characteristic sequelae are also part of the chronic disease. The pain experienced in most cases is severe and incapacitating, and lasts for days or weeks. It has no characteristic distribution or localization, but is usually in or limited to the upper abdomen. Secretory disturbances may be both external and internal, and are notoriously transitory in the acute phase of the disease. Disturbance of the external secretion of the acinar cells of the pancreas or obstruction of the flow of the pancreatic juice along the ducts is demonstrated by increased enzyme activity of the blood and decreased concentration of the digestive enzymes in the duodenal contents. Disturbance of the internal secretion (insulin) may be shown by the presence of clinical diabetes or of a diabetic type glucose-tolerance curve.

Each acute attack or exacerbation leaves a residue of permanent damage. When the accumulated destruction reaches the point that insufficient healthy tissue remains to maintain the normal external and internal secretion, classical steatorrhea, creatorrhea and/or diabetes mellitus develop. Calcification of the pancreas also may be demonstrated by roentgenogram. Other sequelae may result from chronic enlargement of the pancreas. These stem from obstruction of the common bile duct, the duodenum, and the splenic and superior mesenteric veins. Enlargement of the pancreas may also produce a palpable mass in the epigastrium.

Associated or concurrent biliary disease has been shown to exist in a large majority of cases of chronic or recurrent acute pancreatitis. Puestow, Looby, and Risley (11) present a series of 20 cases of which

18 were found to have cholelithiasis. Griessmann (6) reports a series of 80 cases of which 94.2 percent showed biliary disease. Comfort, Gambill, and Baggenstoss (10) of the Mayo Clinic reviewed 89 cases of chronic pancreatitis of which they considered only 29 to be free of primary biliary disease.

The term "chronic pancreatitis" has formerly been applied only to those cases which presented, besides the pain, one or more of the typical sequelae: calcification, diabetes, and steatorrhea. However, it has been pointed out that pancreatitis can be demonstrated histopathologically in the periods of quiescence and, therefore, this disease must be considered one of continuous and progressive nature with relapse or recurrent acute exacerbation.

TYPES OF ACUTE PANCREATITIS

Three distinct types of acute pancreatitis are generally recognized: (a) edematous; (b) hemorrhagic and necrotic; and (c) suppurative. Cunha (7) divides acute pancreatitis into two types: (a) idiopathic acutely severe hemorrhagic and necrotic type; and (b) the less severe but also acute type in which there coexists definite biliary tract disorders, probably the cause of the disease. The prominent histopathologic features of the chronic disease in the quiescent stage are interstitial fibrosis and residual necrosis of the pancreas. This fibrosis represents the regressive end phase of repeated attacks of acute inflammation. Comfort, Gambill, and Baggenstoss (10) point out their observation of perineural lymphocytic infiltration as a prominent finding in view of the severe abdominal pain associated with this disease.

DIAGNOSIS

Wide variation in the symptoms, the lack of common localizing signs or symptoms, and the similarity of the clinical picture to many other acute abdominal disorders make early diagnosis of an acute attack of pancreatitis difficult. Rapid onset of severe upper abdominal pain with nausea and local tenderness is the usual history. The pain is most frequent in the epigastrium and in the right upper quadrant, the latter because of the frequent association of biliary tract disease. Radiation of the pain is not constant.¹ Tenderness and rigidity of the abdominal muscles are usually associated with the pain and are in the same areas in which the pain is located. Some degree

¹ It is reported by Lewison in 74 percent of 35 cases as follows: to the back, 21; right shoulder, 3; interscapular region, 3; left shoulder, 1; and umbilicus, 1. Other authors differ widely in the reference to radiation to the back. Cunha (7) states that radiation straight through to the back is one of the almost constant features of this disease. Puestow et al. (11) state that the pain rarely radiates to the back. Somewhere in the middle the more correct estimation will lie.

of nausea and vomiting is commonly present. Lewison (1) reports nausea and vomiting in over 71 percent of his cases. Morton and Widger (3) report it in 75 percent. A past history of previous attacks is obtained in about three out of four cases; these being similar in nature but milder, as a rule, than the present illness. Jaundice, a peculiar gray cyanosis, and a palpable mass are occasional findings.

The presence of shock seems to depend more upon how long the disease has been present at the time the patient is first seen than on the type of the disease. In the early stages, the absence of shock is a notable expected finding. Elevation of temperature is characteristically slight and is unrelated to prognosis or to the choice of management. The pulse is in keeping with the elevation of the temperature, except in those cases in which obvious shock prevails.

Certain laboratory data are helpful in making the diagnosis. The white blood cell count in 65 to 75 percent of the reported cases was found to be between 12,000 and 17,000 per cubic millimeter with a marked predominance of polymorphonuclear leukocytes. The urine often contains albumin, especially in the cases associated with gall-bladder or biliary tract disease. Glycosuria is an occasional finding in late stages.

The most helpful and significant laboratory procedure is the chemical study of the serum enzymes (amylase and lipase), especially when done repeatedly. The most practical and clinically feasible determination is that of the amylase because of the simpler procedure and shorter time required for its measurement. Comfort and Osterberg (8) have presented an excellent description of the technique and interpretation of the two tests. It has been extensively shown that the serum amylase value remains within certain limits in practically all types of disease except acute pancreatitis. In this condition there is a rapid significant rise in the amylase in multiples of the normal range. In no other condition in which the clinical picture of an acute condition within the abdomen is present is the level of serum amylase so strikingly elevated.

The normal value with the iodine method of determination of the serum amylase has not been established but varies between 70 and 320 units. However, the lack of normal values is insignificant in view of the height of the rise of this enzyme in acute pancreatitis. An elevation ranging from 1,000 to 3,000 units is significant in acute pancreatic diseases. Values between 400 and 900 units have been found to signify secondary or minor involvement of the pancreas in diseases of other organs or systemic diseases.

Another method of determining the serum amylase value in milligrams is reported. Normal values range from 80 to 150 mg. This is derived from the determination that the amylase in 100 cc. of blood

will produce, from starch, reducing substances equivalent to reducing 80 to 150 mg. of glucose. By this method, the pathologic elevations obtained in acute pancreatitis or obstruction of the pancreatic ducts also lie in a range of 1,000 to 3,000 mg. per 100 cc. of blood.

A test procedure useful in either the acute or chronic phase is examination of pancreatic juice obtained by a duodenal sound. This procedure and its interpretation is described by Oviedo Bustos (5) and Cunha (7). Results of this examination can aid materially in establishing the diagnosis of pancreatic dysfunction, whether due to obstruction of pancreatic ducts or to fibrotic replacement or atrophy of the parenchyma of the pancreas. Glucose tolerance or insulin sensitivity tests are of value if islet hypofunction is suspected.

Roentgen examination is of little positive help in establishing a diagnosis. Findings negating a diagnosis of pancreatic disease may be obtained occasionally; such as air under the diaphragm, which would indicate a perforated hollow viscus, or the scattered puddling or ladder signs which would lead one to suspect an obstructive intestinal lesion. Rarely, a soft tissue mass may be demonstrated in the upper abdomen from which, unfortunately, no direct conclusion can be made as to the presence or absence of pancreatic disease.

When the gallbladder study reveals no disturbance of function and the absence of stones, and yet the patient complains of symptoms referable to the gallbladder, chronic pancreatitis must always be ruled out. It must also be considered in the postcholecystectomy recurrence of symptoms of biliary disease; i. e., biliary dyskinesia.

DIFFERENTIAL DIAGNOSIS

When one has mentioned a pain sudden in onset, localized in an area just above the umbilicus, severe, sharp, radiating through to the back, with some degree of nausea and vomiting, and then some degree of prostration and shock, one has covered about all that is present in acute pancreatitis. But, unfortunately, the same symptom complex describes a great many other acute upper abdominal conditions (1).

Lewison reports a diagnosis of acute pancreatitis correctly made in only 11 percent of a series of 35 cases. It was suggested as an alternate diagnosis in an additional 17 percent (1). Acute disease of the gallbladder was the erroneous diagnosis most commonly made in cases subsequently proved to be disease of the pancreas. It is reported to be from 60 to 75 percent of the diagnoses. Others, in approximate order of frequency, are perforation of a peptic ulcer, stone in the cystic or common duct, acute intestinal obstruction, mesenteric thrombosis, coronary occlusion, duodenal diverticulitis, acute appendicitis, tabetic crisis, and hydronephrosis. A careful and exhaustive elicit-

tion of past history, plus the indicated and appropriate laboratory and roentgen examinations, will serve greatly to differentiate these common errors. The major aid is a high index of suspicion.

The routine determination of the blood amylase in all conditions resembling an acute condition within the abdomen will enhance greatly the diagnosis of pancreatic disease and serve to differentiate early in the clinical course such conditions as biliary disease, perforated ulcers, and appendicitis.

CASE REPORT

F. H. G., a 33-year-old male was admitted 19 January 1947. He stated that since 1939 he had had six major episodes of upper abdominal pain associated with vomiting and diarrhea, and many less severe attacks. He repeatedly required hospitalization. The attacks lasted from a few days to 3 weeks. He described a typical attack as follows: After a starvation period of 24 to 36 hours marked anorexia began which was followed shortly by nausea and vomiting. At first the vomitus contained large quantities of gland fluid but soon became retching in character. Four to five hours after the onset of the retching a dull pain occurred in the upper abdomen with no radiation. He specifically denied radiation to the back. By this time a frank aversion to food had developed and forced eating resulted in immediate severe vomiting concurrent with an increase in the upper abdominal pain. Recorded oral temperature in this stage of the attack has been as high as 104° F. Usually, however, it was in the range of 100° to 101° F. The temperature tended to stay elevated and then to fall by lysis with small diurnal variations. The patient stated that he was moderately to severely ill during the febrile stage of his illness. Bed rest, sedation, and belladonna proved effective treatment in all of his major attacks. During the attack in October 1946 the patient first noticed a mass in the left epigastrium protruding from beneath the left costal margin. This mass disappeared with the lysis of the attack and reappeared on two subsequent attacks, again to disappear at the cessation of the acute phase. The mass was described to be approximately 5 inches in diameter, relatively hard, moderately tender, and thick. No evidence of fluctuation was ever elicited.

His complaints on this admission were anorexia, vomiting, umbilical pains, and diarrhea. The attack was preceded by a period of abstinence from food, coupled with an alcoholic debauch. Examination revealed a moderately obese, dark-skinned male of about the stated age, obviously subacutely ill and in no unusual distress. There was no evidence of shock. The temperature was 100.5° F., pulse 80, respiration 20. There was diffuse abdominal tenderness with spasm in the upper recti. A mass approximately the same as described above was found in the left epigastrium and was decidedly more tender than the surrounding abdomen. His clinical course, on a regime of enforced bed rest, sedation, and belladonna, was that of continuous but gradual improvement. He was hospitalized for a period of 4 weeks, during which time clinical and laboratory signs of toxemia disappeared.

Laboratory data: White blood cell count done on the day of admission was 18,000 per cubic millimeter, with a differential count of 75 percent neutrophils (50 segments, 25 banded forms), 19 percent lymphocytes, 3 percent basophils, and 2 percent monocytes. The sedimentation rate was 24 mm. per hour.

On previous admissions within the past 2 years, he has had six white blood cell counts during the acute phases, all of which fell within the range of 12,000

to 18,000 per cubic millimeter. Neutrophils have ranged from 65 percent to 91 percent. Sedimentation rates have ranged from 12 to 24 millimeters per hour. Four serum amylase determinations were done, two during separate acute attacks and two as a follow-up of one of them. A serum amylase determination done 30 September 1946 was 1,777 units. Repeat examinations done on 3 and 12 October were 400 units each. Another done during an acute attack on 12 November 1946 was 2,666 units. Urinalysis, other blood chemistries, and roentgen studies of the gastro-intestinal tract have been negative or normal. A gallbladder series done 28 March 1947 revealed no disease condition.

Follow-up: Since recovery from the latest attack the patient has been asymptomatic. Physical examination revealed no tenderness or spasm and no palpable mass. Laboratory examination revealed a normal white blood cell count and sedimentation rate.

DISCUSSION

Recurrent acute pancreatitis is distinguishable as a disease of repeated acute attacks or exacerbations separated by periods of more or less quiescence or subclinical disease. As a result of recent investigations the reported incidence of this disease is increasing. Available statistics suggest occurrence more frequently in women than in men and in the 45- to 60-year age group. Proved cases in patients aged 2 years and 70 years have been recorded (7). Griessmann (6) reports that 90 percent of his series of 80 cases were women. Other authors have pointed out the high incidence of the obesity in this disease. This and the sex incidence seems to be a factor in the high rate of biliary tract disease associated with recurrent acute pancreatitis. Previous history of gastro-intestinal or biliary disease, or of subclinical symptoms suggesting these diseases, is obtainable in a high percentage of the cases.

In the later course of the disease impairment of the internal and external secretions of the pancreas may be present. Disturbance of function may be transitory and mild or may be widespread. When the accumulated residual damage from recurrent acute exacerbations has become sufficiently extensive glycosuria, hyperglycemia, steatorrhea, and creatorrhea may appear and persist (10). Pancreatic stones or calcification of the entire gland may occur. A cyst or enlarged pancreas may be palpable.

Certain other sequellae secondary to the disease in the pancreas, are obstruction of the common bile duct, jaundice, hepatitis, disease of the gallbladder, obstruction of the duodenum, and thrombosis of the portal vein.

Diagnosis of this condition can be based upon three groups of findings: (a) the history and physical examination, (b) changes demonstrable in the external secretion of the pancreas, (c) changes demonstrable on the internal secretion of the pancreas, including determination of the amylase in the blood.

It has been shown that any elevation of the blood amylase indicates some involvement of the pancreas, and in some degree the amount of the elevation is related to the severity of the involvement. It should be emphasized that an elevated amylase value does not in any way indicate what sort of basic pathologic condition is present in the pancreas. It serves only to disclose acute pancreatic disease. Determination of the blood amylase does not materially aid in evaluating the prognosis of the disease. In occasional cases successive amylase values will be found to fall slowly to subnormal values particularly in cases ending fatally.

Numerous theories of the causation and pathogenesis of this disease have been advanced. Polowe (9) states:

A study of the literature makes it apparent that both the "common channel theory" of bile reflux and the "obstructive theory" with its concomitant concentration of the alkaline pancreatic juices within the pancreas are both tenable etiologic factors in the production of acute pancreatitis. The reflux theory is a plausible explanation of the high incidence of cholecystitis in pancreatic disease. When these theories are understood and reflected upon it becomes easier for the clinician to interpret blood amylase activity in biliary tract disease, and the need for repeated blood amylase activity determinations in borderline cases becomes more apparent.

In the edematous type it also seems reasonable to consider an angiospasm, specific toxin, or a virus infection while in the suppurative type it is necessary to consider an hematogenous source such as septic embolus.

The high incidence of proved associated gallbladder or biliary tract disease does seem to lend weight to the theories of reflux of bile or obstruction of the external ducts of the pancreas as the primary pathogenic factor especially in the acute hemorrhagic and necrotic types of pancreatitis.

Until recently acute and recurrent pancreatitis were believed to have a high mortality rate. Recognition of sublethal cases, and a trend toward conservative instead of surgical management of the disease when correctly diagnosed has considerably lowered the recorded mortality. Griessmann (6) reports a reduction at his clinic from 34 percent to 13 percent, which he attributes to the adoption of the conservative rather than the surgical management. Lewison states, "A more careful study of the deaths from the different types of pancreatitis indicates that the mortality rate is directly dependent upon the pathological involvement of the gland and upon the type of the acute pancreatitis." His average mortality rate was 17 percent. The series included a large number of cases of edematous pancreatitis, as well as less acute phases of hemorrhagic and necrotic pancreatitis. This fact is cited as a likely explanation of the low mortality figure (1).

TREATMENT

A perusal of the literature reveals a lack of agreement as to whether or not to do surgery, and, if so, what to do. The difficult differential diagnosis and the alarm attached to an "acute abdomen" make surgical intervention more frequent than is thought to be indicated. Many surgeons claim that if they were sure of the diagnosis of pancreatitis they would not perform surgery in these cases but are forced to do an exploratory operation in the face of an acute condition within the abdomen.

It is commonly agreed that in suppurative pancreatitis, especially in the presence of a high white blood cell count and chills and fever, that surgical drainage of the abscess is indicated. The most commonly accepted operative procedure in acute edematous or hemorrhagic pancreatitis is a wide opening of the peritoneum over the pancreas and the placing of drains over the gland. Extensive incision of the substance of the pancreatic gland is thought to yield no benefit and even thought to be detrimental in view of the release of toxic and destructive juices into the peritoneal cavity.

If jaundice or other signs of obstructive biliary disease are found, decompression of the biliary tree is indicated. This is best obtained by external drainage of the gallbladder. Some authors are of the opinion that a cholecystectomy should be done first, since it must eventually be done anyway. Others contend that the more extensive procedure necessary and the inherent surgical shock definitely contraindicates cholecystectomy in such a critical disease. More decompression is accomplished through a cholecystostomy than by removal of the gallbladder. Drainage of the common duct in conjunction with cholecystectomy presents some benefit from both standpoints but is more extensive and traumatic than either of the other procedures, and because of this, is reasonably contraindicated.

Many authors believe that eventual surgical intervention is necessary to bring an end to the progressive nature of this disease. On the premise that a reflux flow of bile or obstruction of the common bile or pancreatic ducts is a factor, corrective procedures on the biliary tree, gallbladder or pancreatic ducts are in order. The recorded results are favorable.

Approximately 66 percent of the surgical deaths occur within 2 days after surgery. This would indicate either poor preparation for surgery or intrinsically severe pathologic condition which would have caused death in itself. "Failure to rally or to respond to postoperative therapy would appear to corroborate the belief that the added insult of emergency surgical operation (without sufficient preparation of the patient) was more than the patient's condition warranted." (1)

The pancreas is credited with tremendous powers of recuperation if left unmolested. This is pertinent both to the medical and surgical management of these patients. If upon surgical exploration of the abdomen acute pancreatitis is found, this recuperative ability of the pancreas is enhanced if the surgeon restrains himself and performs the simplest possible procedure. This is especially true in avoiding extensive incision of the gland.

Cunha (7) presents five major points in the management of the acute exacerbation:

1. "*Relief of pain.*"—Such drugs as morphine will be required. In contradistinction to biliary colic, the pain returns and requires morphine at regular intervals in acute pancreatitis. Other drugs such as nitroglycerin, the belladonna alkaloids, and ephedrine have been found advantageous.

2. "*Relief of gastric distress.*"—It is important that nothing be given by mouth. This will avoid stimulation of enzyme production in the remaining, but still diseased, pancreatic tissue. It seems reasonable that such stimulation would produce further damage.

3. "*Indwelling gastric suction catheter with frequent removal of stomach contents.*"—Continuous suction is not necessary.

4. "*Maintenance of fluid balance.*"—Intravenous fluid (physiologic saline) is the major therapeutic weapon in the medical management. There is controversy over the use of intravenous dextrose. It would seem reasonable to give dextrose, combining it with sufficient regular insulin to insure control of the blood sugar level.

5. "*Surgical intervention.*"—This is indicated whenever there is doubt as to the correctness of the diagnosis, or whenever signs of suppuration or biliary obstruction occur.

In the quiescent stages of the disease efforts should be made to determine the presence of biliary disease, and to correct it if found.

Management of the patient with a chronic pancreatitis (recurrent acute pancreatitis with residual chronic symptoms) can be conducted along the lines of:

- (a) General invigoration of the patient by dietary management, elimination of alcohol (which is commonly linked with the precipitation of attacks), and giving dilute hydrochloric acid (in the presence of hypochlorhydria), iron and vitamins.

- (b) Specific replacement therapy for insulin deficiency is indicated.

- (c) Administration of pancreatic substance by mouth renders excellent symptomatic relief from dyspepsia, loose bowels, food intolerances, and abdominal distress.

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Psychiatric Uses of Sodium Pentothal¹

Experiences in a Forward Area

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THE FUNCTIONS of a psychiatrist in a combat zone will necessarily be determined to a large extent by the specific mission of his ship or unit. Apart from rest, sedation, and general nursing care, however, psychiatric treatment, especially psychotherapy, is usually limited by such factors as the variable volume and flow of patients, rapid evacuation, and other demands on the psychiatrist such as giving plasma, blood, and anesthetics to acute surgical cases. Nevertheless, early treatment is important for psychiatric patients, especially for those with true war neuroses, so that legitimate techniques of brief therapy are of great value under combat conditions.

The use of intravenous sodium pentothal in the acute war neuroses is described in one of the psychiatric classics of this war: Grinker and Spiegel's *War Neuroses in North Africa*.² This monograph was widely distributed among psychiatrists of the Armed Forces and was taken as part of our basic information. The purpose of the present article is to describe the employment of a similar technique in a strictly Navy combat situation, to illustrate uses and limitations of pentothal interviews, and to present a number of brief case histories.

Pentothal interviews were given to about 25 percent of the neuropsychiatric patients coming to a ship serving briefly as a casualty evacuation ship and later as a casualty receiving ship in an anchorage on the fringe of an active invasion. Except for one Marine and two naval air crewmen, all of the patients receiving pentothal interviews were Navy personnel from ships on patrol or picket duty guarding the approaches to the immediate theater of combat—ships that for several months endured some of the most arduous and harrowing duty in naval history. The pentothal interviews were given either

¹ From the U. S. S. *Gosper*, submitted August 1945.

² Lt. Col. Roy R. Grinker, M. C., and Captain John P. Spiegel, M. C.: *War Neuroses in North Africa: The Tunisian Campaign (January-May 1943)*, Joshia Macy, Jr. Foundation, New York, N. Y., 1943.

in the four-bed mental ward or, more commonly, in an empty troop-berthing compartment just below a similar compartment used as the sick bay for ambulatory patients. Here it was possible to find a corner that sometimes approximated privacy, quiet, semidarkness, freedom of movement for the patient, and a vantage point for the psychiatrist. The pentothal (a 2.5 percent solution in a 20 cc. syringe) was given intravenously as the patient slowly counted backwards from 100 until the counting became confused or until he yawned once or twice. Between 0.3 and 0.4 gm. was usually sufficient, especially if the patient had been given amytal or nembutal as a sedative the previous evening. Unless he began talking spontaneously, the patient was then told that he was back on his ship and in what, from the history, appeared to be the symptom-producing combat situation. When this proved nonproductive, the interview was utilized for further history-taking or confirmation of already described experiences.

The patients thus interviewed may be grouped as follows: (*a*) Severe anxiety states; (*b*) moderate anxiety states; (*c*) anxiety states with moderate depression; (*d*) psychotic reactions; and (*e*) suspect malingerers (all, in fact, neurotic characters—"psychopaths"). Two points may be made in advance of further discussion: (*a*) Striking therapeutic results were obtained only in the cases classified as severe anxiety states; and (*b*) the technique employed cannot be called "narcosynthesis" (after Grinker and Spiegel) because shipboard conditions and rapid turn-over of patients did not permit more than superficial, reassuring psychotherapy following the pentothal interview. "Narcosynthesis," properly so-called, embraces not only the use of pentothal, but also follow-up psychotherapy based upon principles of dynamic psychology.

The cases classified as having severe anxiety states were for the most part, dazed, confused, and inaccessible. Several were mute and two were deaf. Two had auditory hallucinations of planes and General Quarters alarms. One had a severe ticlike jerking of the entire upper part of the body and another was in a severe "hysterical" state despite heavy sedation. Previous combat experiences (such as London "buzz bomb" attacks) appeared to be significant factors in two cases. Remarkable familial instability or neurotic patterns prior to combat duty appeared in only one of this group.

CASE REPORTS

Case 1.—A 22-year-old male of stable rural background, completed high school at 17 and farmed until inducted at 21. Although "bothered" by the noise and concussion of his ship's guns, he had no symptoms until his ship was attacked by a number of enemy suicide planes, four or five of which actually dived into his ship. On admission patient was dazed, confused, mute, and seemed to be

deaf and unable to read or comprehend written questions. The first pentothal interview, about 18 hours after his ship was hit, was unproductive except for showing that patient was neither deaf nor mute. He muttered something about a "cheap drunk" but seemed too exhausted to respond further. Afterwards he was as dazed, confused, and unresponsive as before. A second pentothal interview, 2 days later, led to free verbalization, but without remarkable affective display. He appeared apprehensive, rubbed his left elbow, and was restless. He described the separate attacks of four suicide planes while he was at his gun station. He fretted over the loss of his gun loader and feared the gun firing above him as much as the enemy. As the effect of the pentothal wore off he continued to talk freely. After 2 days he remained animated and symptom-free except for slight dizziness with sudden changes of position. He recalled that one plane hit near his battle station, and it may be assumed that he suffered some blast concussion.

Case 2.—A 21-year-old male of apparently sound background and 3 years' service in the Navy, was admitted 2 days after an attack on his ship by six enemy suicide planes, one of which managed to crash into the ship while another bombed and strafed survivors in the water. Patient was deaf, mute, and confused, having a "blank" facial expression and apathetic movements. A pentothal interview the day after admission brought forth confused material, but great affect, as he talked about the attacking planes, dived under the pillow as they "came in," called to his shipmates, and gently shook and patted his pillow as he attempted to arouse a dead buddy. After describing abandoning his ship, he retched as if having swallowed oily sea water. Following the interview he was animated and pointed to his mouth saying "I can talk now." Soon, however, he was somewhat depressed over his inability to hear. A second pentothal interview 3 days later produced a more coherent story, still with considerable affect, describing the same events and culminating in rage at being strafed in the water and then, after the bomb exploded, "I can't hear: I can't hear anything," with great anxiety as he clutched the sides of his head, covering his ears. The patient continued to be alert after this interview and talked freely in response to written questions. His deafness remained, and it was considered an organic sequel to blast concussion.

Case 3.—This 19-year-old male was the only one of this group having a clearly unstable background, but in some respects, he had the most traumatic experiences and made the most dramatic recovery so far as 1 week's observation is concerned. His father, a skilled worker, had "heart trouble and ulcers" for many years and his mother is "very nervous" so that, when excited, "she shakes all over." The patient himself had "sleeping sickness" at 13, being unable to stay awake or retain food for 2 weeks. He walked in his sleep as a child and, at such times, often urinated in the coal bucket. Always somewhat tremulous, he nevertheless worked as a steeplejack after finishing the eighth grade at 15. Following 18 months in the Armed Guard, he was on a destroyer for 6 months when he was transferred because of acute appendicitis. A few days after the appendectomy, the ship on which he was a patient was hit by an enemy suicide plane in such a way that the sick bay was wrecked and set afire and an adjoining compartment wiped out. Climbing out of the wreckage, the patient found another patient whom he attempted to drag to safety, but found himself too weak to save him. As the flames were beginning to burn both of them, he had to abandon his shipmate. A few hours later, en route to a hospital ship, the craft in which the patient was being transferred "took a bomb" which failed to explode, but passed through the bottom and sank the boat. Rescued again, he was put on a hospital ship, evacuated to a rear area, and then returned to his original ship when he

recovered. At that time he learned, without previous intimation of such trouble, that his parents had separated. This upset him, but it was not until some days later, when his ship's guns were fired for the first time since his return, that acute symptoms developed.

Patient became highly excited, developed a "startle reflex," and had several acute "hysterical" episodes prior to admission. When admitted he was "drunk" with sedatives, but still very tremulous, startled, and apprehensive of the slightest unexpected noise, tending to throw himself about, roll his eyes, and demand considerable attention. Despite the previous heavy sedation, he was given pentothal on the day of admission. He vividly described the explosion and fire on the ship where he had been a patient and his efforts to rescue his shipmate. He did all he could, but he was too weak. He had to go on or be burned to death himself; "in a spot like that you think of yourself." Then, with even more feeling, he talked of the separation of his parents. He bitterly accused a neighbor woman of "stealing" his father's affections. "If I ever see her again, it's either her or me." The feeling about his shipmate was one of regret rather than guilt while the feeling about his parents' situation was marked hostility toward the "seducing" neighbor. The next day, the patient was up and about, cheerful, animated, and active. During a General Quarters alarm he was somewhat tense, but not overly upset. He improved further in the following 4 days prior to transfer and was superficially quite normal.

Cases like these illustrate several features of pentothal therapy. For one, the interviews, even without intensive follow-up psychotherapy, facilitate the expression of pent-up, painful experiences and affect-laden memories which, when verbalized, are to some extent worked-through with relief of the more disabling symptoms. From an administrative point of view, patients thus improved require less supervision and can be transferred ambulatory. They leave the ship on the way to recovery. There is less reason to expect that the symptoms will be made worse by the use of restraints, close confinement, or strict supervision that might otherwise be necessary in transit to the rear. The first case illustrates the point that too early use of pentothal may be ineffective. Whether because of blast concussion or sheer physical and mental fatigue (or even because the traumatic experiences had not become assimilated by the psyche), the patient could not derive the benefit from his first interview that he clearly did 2 days later.

The group of moderate anxiety states presented a picture commonly seen in "combat fatigue." The patients uniformly complained of anorexia, insomnia, combat nightmares, and various cardiac and gastro-intestinal symptoms. They evinced varying degrees of "startle," restlessness, and irritability. Not all conformed to the accepted Navy definition of Fatigue, Combat, since the preservice histories were variable, but all in this group had seen grueling combat duty prior to the appearance of incapacitating symptoms. In several cases there were also such "extraneous factors" as domestic problems, lack of confidence in superiors, and frustrations of one sort or another.

CASE REPORT

Case 4.—Patient was a lieutenant (junior grade), 25 years of age, whose father was described as a driving, exacting, and successful professional man and whose mother was always well except for recent menopausal symptoms. The elder of two children, he had no neurotic childhood traits, but was always conscientious and disposed to worry over his studies, grades, and the like. Despite frequent exposure to bombings and suicide plane attacks over a 2-month period, he was well until his own ship was hit by a 500-lb. bomb with the loss of several men. He was admitted 2 weeks afterward complaining of nervousness, poor appetite, insomnia, shakiness, dreams of being chased by Mexicans with knives, recent episodes of sleepwalking, and a persistent feeling at night that Japs were on his ship, creeping up behind him in the dark. Under pentothal, he told with some affect about his numerous narrow escapes, the long hours at General Quarters, and his feeling that the Skipper was "neurotic." Then, when the bomb hit, he saw parts of one man splattered over the fantail, he found another man having "hysterics" in the wardroom, and he had to fingerprint the dead. He was unable to sleep and other symptoms soon appeared. The material pointed to his identification with the boys who were killed, his anxiety at the scenes of mutilation, and his lack of confidence in the Skipper ("father-figure"). There was but slight improvement following the pentothal interview and a letter several weeks later indicated that, to him, his status was unchanged.

Such a case indicates the need for intensive psychotherapy following ventilation by pentothal interview. In spite of the absence of significant past history on routine history-taking, the material shows clearly the presence of deeply repressed conflicts dating from early relationships with his father and only activated by a special combat situation. Such cases lead one to suspect the validity of studies based upon arbitrary distinctions between patients with and without so-called "psychopathic backgrounds." Perhaps the only sound distinction that can be made is on the basis of whether the ordinary psychiatric history, requiring, perhaps, an hour to elicit and record, shows or fails to show evidence of neurosis or other maladjustment prior to military service. The more profound task of psychopathology, however, is to elucidate direct connections between previous personality patterns, no matter how latent, and the neurotic or other reactions precipitated by combat experiences.

In the present series of cases, nearly half the patients with moderate anxiety symptoms came from clearly unstable homes and gave evidence of neurotic traits since childhood. Such a case is the following:

CASE REPORT

Case 5.—The patient, a 21-year-old male, had been in the Navy 2½ years and had 25 months' destroyer duty. Previous combat duty consisted of escort operations in combat waters and bombardments near Attu, New Guinea, the Admiralties, Bismarck Islands, and the Ryukyus. His father, over 50, was as described, both alcoholic and paranoid. His mother, 39, was very "nervous." Their marriage was "forced" and there was no love between them. The father never accepted the patient as his own son and consistently abused him, especially

when drunk. Four younger children were accepted by the father. When patient was 10 he was badly frightened when his drunken father nearly wrecked the family car. At the age of 15 patient went to live with his grandmother. He completed the tenth grade at 17 and shortly thereafter joined the Navy. Although always somewhat nervous and "shaky" since the car accident in childhood, he did not become acutely upset until he had been on picket duty for 1 month. He then saw a suicide plane attack his ship and drop a bomb which, though a near-miss, killed several of his mates. A few days later he saw suicide planes barely miss a nearby ship. This precipitated acute symptoms including anorexia, insomnia, nightmares of suicide planes, "startle," and tremulousness. On admission he was restless, worried looking, and apprehensive. Under pentothal he was much the same. He jumped at sudden noises, wanted to "get out of here," cried over the death of his shipmates, and was very apprehensive during General Quarters. There was no release of repressed memories or feelings, and despite reassurance, no improvement followed the pentothal interview.

Such patients have well-established personality defects or neurotic patterns and their combat experiences only make them more conspicuous. They require intensive psychotherapy for significant improvement.

In a number of cases having moderate anxiety symptoms, a considerable element of depression was also noted. In one such case the depression was related to patient's failure to rescue a buddy from a burning boiler room; in a second case, the patient, in the excitement of a suicide plane attack, fired upon what he took to be a suicide boat, but which proved to be friendly; and in a third case, the patient, having survived a plane crash and many hours on a life raft in enemy waters and, as he thought, had been promised survivor's leave, but had been sent directly back to combat duty. The psychodynamics varied from patient to patient, but mechanisms of mourning and of dealing with repressed hostilities were seen in most of them. These cases are mentioned as a separate group because they responded poorly to pentothal interviews, finding it difficult to verbalize their hostile or resentful feelings. It is considered that treatment in such cases is incomplete without psychotherapy and that pentothal alone is of little value. Grinker and Spiegel have suggested, in line with civilian experience, the use of shock therapy in depressions, but again, only as preliminary to psychotherapy when the patient becomes accessible.

In a small number of patients with psychotic reactions, except for one schizophrenic, pentothal interviews were likewise unproductive. The patients talked and behaved under pentothal just as they did before, and there was no change afterward. This was anticipated on the basis of psychodynamic principle since psychoses are marked, not by simple repression, but by freedom from repression, dissociation of affect, or other mechanisms of complex symptom formation. It may be mentioned, that sub-shock insulin therapy was given to three of

these patients (one a manic with paranoid coloring, one a moron with schizophrenic symptoms, and one a typical simple type schizophrenic) with very good results from an administrative point of view in the first and third cases. The insulin was given on four successive mornings in the following doses: U40-60-70-70.³ The manic patient had two series with a 2-day interval between. The period of reaction (sweating and sleep) was terminated after 3½ to 4 hours, and the patients were up and about in the afternoon. The two who improved did so sufficiently to be transferred as ambulatory patients with minimum supervision; the manic was normally quiet and sociable while the schizophrenic was superficially normal except for mild paranoid delusions centering upon a former officer.

A group of three suspect malingerers is considered separately because pentothal interviews were used in differential diagnosis. In this small group the patients were really neurotic characters—immature, unstable or, in one case, supposedly clairvoyant—but, as so often happens in the case of “psychopaths,” their symptoms had provoked considerable hostility on the part of superiors or medical officers and the question of malingering had arisen. The pentothal interviews were used principally for checking on the validity of their complaints and past histories.

CASE REPORT

Case 6.—This 27-year-old male had rather vague anxiety complaints and frankly admitted that he would like to go home. He stated that he had been afraid of the dark since childhood and unable to tolerate being alone. He had been enuretic into his 'teens. Before coming to sea he had been upset because his wife had a miscarriage and he was denied leave to visit her. He had no overt symptoms, however, until his ship was strafed and he saw another ship hit by a suicide plane. After that he was “no good” and “went all to hell.” He had sensations of blood rushing to his head: “Something happened to me, I don't know what.” He was vague as to his complaints and picked up symptoms suggested to him. He hung around the medical officer's desk and was observed (by Corpsmen) to be much better when the medical officer was elsewhere. He was considered a “sluffer off” by three experienced Corpsmen.

When pentothal was suggested, patient whined that he was “all right” and did not want the injection. He nevertheless acquiesced passively and soon dropped off to sleep. When aroused he talked directly to the medical officer, said he had always been afraid of the dark and reproached himself for being weak and fearful on his ship. He recounted a dream of a green-faced man coming toward him menacingly and another of a Negro pulling a knife on him. He told of how frightened he was when he saw a suicide plane crash into a ship near his. He wants to do his duty, but he misses his wife and children terribly. After the interview, patient was told that he might be sent back to his ship. He agreed to try it again, but his attitude remained passive, helpless, whining, and dependent and it was clear that he was anxious and profoundly

³ Suggestion of J. F. Morrell, HM2 (N-P technician), based upon experience at the U. S. Naval Hospital, Chelsea, Mass.

unstable. When his health record was received it showed a long history of minor complaints since coming to sea and described acute panic during combat.

In differential diagnosis, pentothal may be useful in cases other than suspect malingerers. One example was that of a young ensign who had had previous combat duty as an enlisted man and was about to go to sea for the first time after officer training. He developed vague neurological signs and symptoms about which an experienced neurologist was doubtful in the face of a somewhat unstable family background and the obvious possibility that he might be apprehensive about returning to combat duty. Under pentothal, however, patient had exactly the same signs and symptoms, betrayed no anxiety, and revealed nothing that had not been elicited easily in the waking state. It was concluded that his difficulties were organic and, after a few weeks of rapidly progressing symptoms, he appeared to be a case of acute multiple sclerosis or brain tumor. Autopsy subsequently revealed a malignant infiltrating brain stem tumor.

DISCUSSION

The dynamic theory of neurosis holds that repressed anxiety lies at the core of every neurosis and that the various symptoms of the neuroses are direct or indirect manifestations of this anxiety coupled with the patient's psychological defenses against it. A corollary of this conception is that the most effective therapy is early therapy. Treatment should begin before the pathogenic anxiety becomes too deeply repressed within the personality and before the symptomatic defenses against it become too firmly established as habits. This is especially true of the war neuroses in which at least the precipitating causes of illness are external; i. e., the traumatic experiences of combat. Pentothal interviews are of value to many such patients, especially those with alarming and immediately disabling symptoms, by enabling them to overcome neurotic defenses, give vent to repressed feelings related to traumatic combat experiences, and thus give up the more severe symptoms. Pentothal interviews are also of some use in differential diagnosis. Pentothal interviews alone are considerably less effective, however, in true psychotic states, neurotic reactions of long-standing, neurotic characters, and cases where depression is present.

For readers familiar with the monograph of Grinker and Spiegel it may be added that, even though intensive follow-up psychotherapy was not possible in this series, favorable results were nevertheless obtained in selected cases—cases that correspond to their “free-floating anxiety state—severe” group. The question arises: What marks off this group and, in general, causes both their symptoms and their response to pentothal to be so dramatic? It would appear, though

more evidence is needed, that the important factor is not the severity or intensity of the combat experiences or the presence of manifest personality weaknesses (as elicited by routine psychiatric history), but rather the type of defense employed by the individual against his anxiety—the result of more subtle personality patterns than may be apparent from the history. In those cases in which the anxiety is directly repressed or represented in conversion symptoms, the response to ventilation and abreaction during a pentothal interview is generally good; but where depression, true psychotic reactions, or more complicated psychosomatic mechanisms are used, simple emotional “catharsis” is less effective.

It is worth pointing out, too, that there are situations in which the psychiatrist cannot employ some of the therapeutic leverage available to Grinker and Spiegel. It is not very convincing, for example, to assure the patient that he is now out of danger when he continues to hear frequent General Quarters alarms and therefore to imagine another suicide plane attack. The therapeutic dangers of false reassurance are well known. Nor was it possible, as was usually indicated, to tell the patient with authority that he would not have to return to combat duty, since that decision is reserved for psychiatrists or boards of medical survey in the rear. From the point of view of ego support in the direction of recovery, these are potent therapeutic weapons and where they are wanting the problems of transference and brief treatment are more complicated.

Finally, an interesting problem in the psychology of the psychiatrist may be mentioned. He, if he is introspective to even the slightest degree, will find himself erecting defenses against his own anxieties, and one of these defenses may well be a resistance to adding the burdens of his patients' anxieties to his own. The psychiatrist must identify himself with his patient in order to understand him but, at the same time, retain his objectivity in order to treat him; but to undergo with the patient a number of traumatic experiences which the psychiatrist knows might well be his experiences in a minute, an hour, or a day, is difficult, and he may feel a certain reluctance to invite such vivid reminders of his current reality situation. If the psychiatrist understands this type of resistance, however, he can overcome it and thus do effective work. The inevitable noise and traffic of a ship and the enervating effect of some climates may also be deterrents to sustained work. The task of the psychiatrist would be facilitated, therefore, if ships receiving psychiatric patients for treatment in combat zones could be provided with a relatively sound-proof, air-conditioned private office and treatment room, an amenity that, to a psychiatrist, is as indispensable as is a well-equipped operating room to a surgeon.

Myocardial Infarction at the Age of 21

Report of a Case

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A REVIEW of the literature of myocardial infarction in persons under 30 years of age, shows that coronary arteriosclerosis was always found at autopsy. Syphilis was present in none, and a rheumatic history was noted in only one (1). The youngest patient showing coronary thrombosis was 12 years of age (Dreschfeld and Benda, quoted by Smith and Bartels (22)). Sprague and Orgain (13) reported two cases of fatal myocardial infarction in persons age 15 proved at autopsy. French and Dock (11) reported the autopsy findings in 80 cases of fatal coronary arteriosclerosis in young soldiers from 20 to 36 years of age; of these 39 were under 31. They believed a contributing factor was overweight. With the case reported here the total number of reported cases of myocardial infarction in persons of 30 and under is 67.

CASE REPORT

The patient, a young white man, first noted severe cardiac pain and showed electrocardiographic changes characteristic of myocardial infarction, about one month before his twenty-second birthday.

The first attack of serious chest pain occurred 23 April 1943 while he was in boot camp. Following a strenuous 2-hour work-out on an obstacle course he suddenly developed sharp severe pain in his left anterior chest and fainted. He reported that when he recovered consciousness one-half hour later his chest was taped up and he was told he had pleurisy. The note made in his health record at that time states that his heart and lungs were normal and describes this first episode as a fainting attack. The patient believes that the pain at that time was unlike the subsequent ones described below. We have described the earlier attack of chest pain for the sake of completeness and to emphasize that the patient recognized the type and character of the pain that he had later and which was an important point in making the diagnosis.

The next attack of pain and the first one of true cardiac character occurred while he was on board ship in the Admiralty Islands in December 1944. He was standing by his gun crew directing practice fire when he experienced severe precordial pain which felt as though something was "stuffed into his chest." A medical officer was not available at that time. He had to lie down and the pain

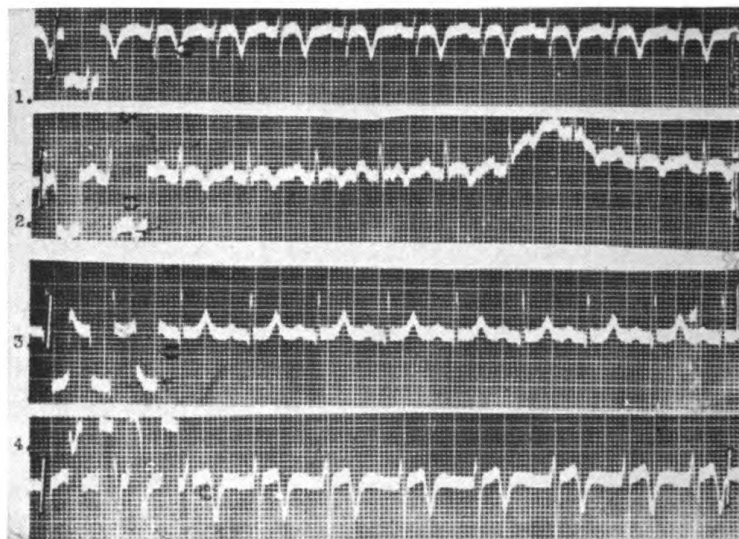


Figure 1.—Electrocardiogram, 30 April 1945.

abated in about 2 hours. Five months later, while home on leave and after he had been dancing in the jitterbug fashion for about 2 hours, he developed the second attack. This time the pain was in the precordium and radiated to his left shoulder and upper arm; after resting for about 1 hour it passed away. Two days later he again experienced the same pain while driving his car. This attack lasted about one-half hour. The fourth attack occurred 2 days later while he was sitting quietly at home with his family and was similar to the others in nature and duration. Ten days later, after he had returned to duty, the fifth attack occurred. He reported to a medical officer and was admitted to the sick list on the same day, 19 April 1945. His health record shows that his sedimentation rate was 24 mm. per hour on that date, and 7 days later it was

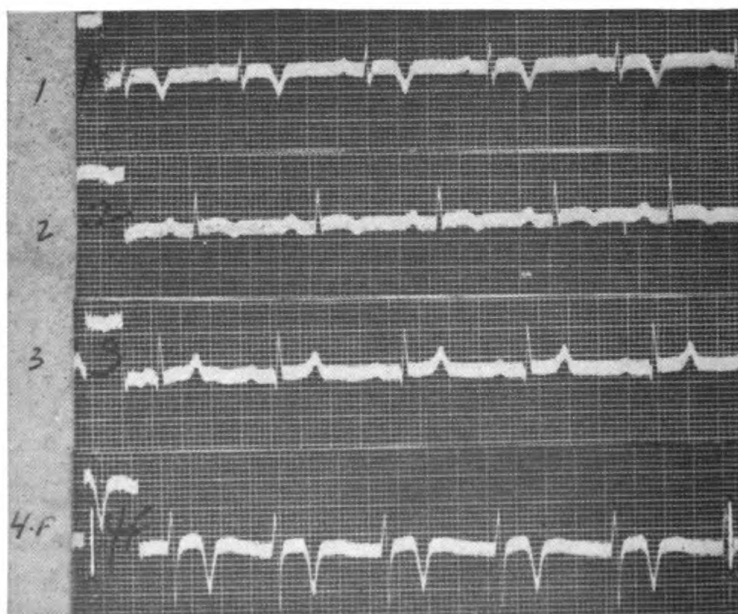


Figure 2.—Electrocardiogram, 10 May 1945.



Figure 3.—Electrocardiogram, 2 June 1945.

reported as still elevated. A leukocytosis was also noted. The first electrocardiogram made on 25 April 1945, showed normal sinus rhythm with a rate of 115 per minute. The P-R interval measured 0.18 sec. and the QRS was 0.08 sec. The P waves were upright and of normal amplitude in the first three leads and were isoelectric in the fourth lead. There were slight elevation of ST-1 measured at 0.5 mm. No Q-waves were present. T-1 and T-2 showed late inversion to a measured depth of 1.5 mm. T-3 was diphasic and very small. T-4 was diphasic with the negative deflection measuring nearly 3 mm. The second electrocardiogram (fig. 1) was taken on 30 April 1945 and showed a number of changes from the first.

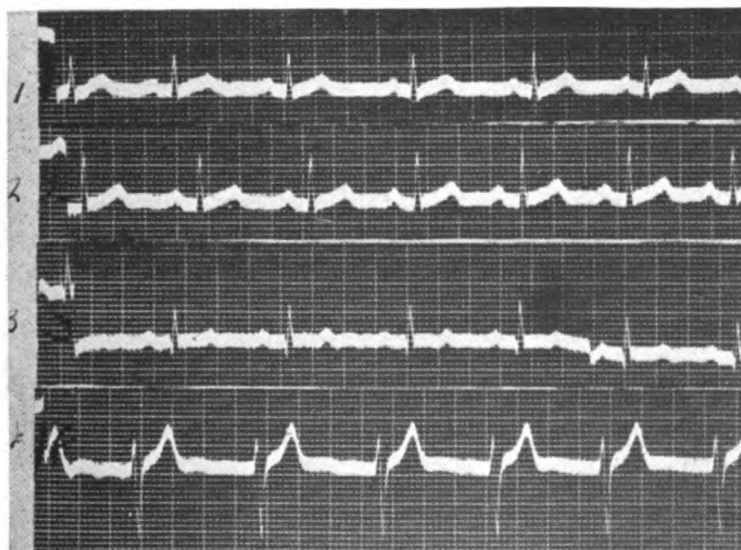


Figure 4.—Electrocardiogram, 24 June 1945.

He was transferred to a naval hospital, on 4 May 1945. The history was obtained by close questioning on admission to the hospital. The patient had never had any of the symptoms of rheumatism, nor had he had any acute infections prior to the onset of his symptoms. Physical examination was entirely normal. A teleroentgenogram showed his lung fields to be clear; TD 12.3, TT 29.0, and the cardiac contour reported as not unusual. On admission his sedimentation rate was 12 mm. per hour, and after that it varied from 13 mm. to 11 mm. per hour for the next month when it dropped to 8 mm. per hour and then to 5 mm. per hour 1 month after that. The third electrocardiogram, the first at the hospital, was made on 10 May 1945 (fig. 2). Shortly after admission the sixth

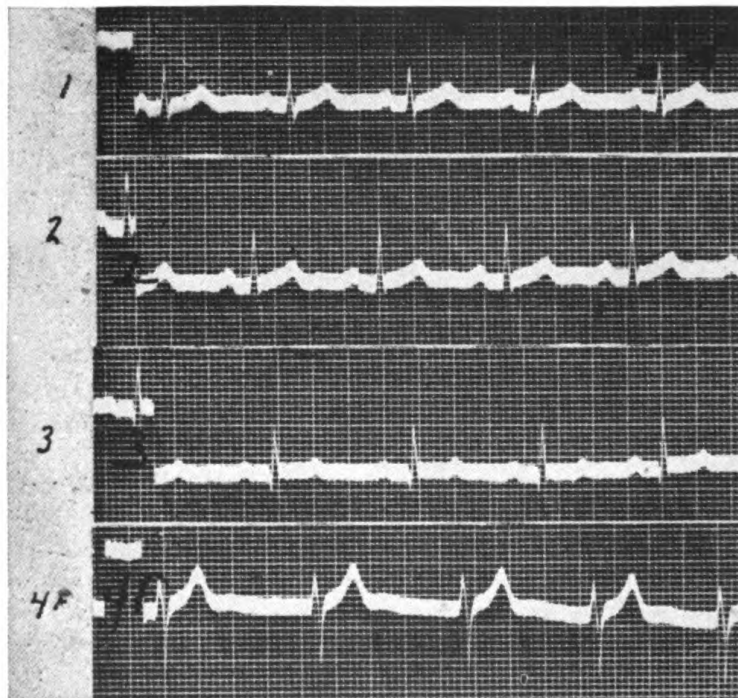


Figure 5.—Electrocardiogram, 3 July 1945.

attack of cardiac pain occurred when he was pushing a patient in a wheel chair. This attack lasted for about 15 minutes. Unfortunately an electrocardiogram was not taken during or immediately after this attack. The patient was carefully instructed to restrict his activities and was not allowed to do any work. Electrocardiograms made at frequent intervals showed progressive changes. The sixth tracing (fig. 3) was taken on 2 June 1945. Tracing No. 8, taken 24 June 1945 was normal (fig. 4). Successive tracings taken in July 1945 remained normal (fig. 5).

Other laboratory studies were negative. Though his activities have not been restricted beyond the prohibition of sports and other exercise the patient has been well and symptom-free since a few days after admission to this hospital.

COMMENT

This case was discussed at cardiac conferences on two occasions. Some clinicians were doubtful that this patient had myocardial infarction because of his youth, the rapidity with which his electrocardio-

gram returned to normal, and the absence of Q-waves. These clinicians were inclined to attribute the changes in his heart to rheumatic fever. However in the absence of any history of rheumatic fever, and with the story of repeated, separate attacks of pain of a "coronary" character and pattern and with the electrocardiograms showing the pattern of anterior infarction the authors believe that they are correct in making the diagnosis of myocardial infarction in this case. The rapidity of the changes in successive electrocardiograms from abnormal to normal can be explained on the basis of a small anterior infarct which healed rapidly.

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Hypertrophy of the Heart of Unknown Cause in Young Adults

Report of Two Additional Cases

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IN 1946 Norris and Pote (1) reported from the Philadelphia Naval Hospital the cases of four men between the ages of 20 and 30 years who died of congestive heart failure. At autopsy, unexplained hypertrophy of the heart was present in all. In none was there evidence of antecedent hypertension, valvular disease, or significant lesions of the aorta or coronary arteries. Although a few minute foci of degeneration were found in the myocardium after careful search and in two there were mural thrombi in the ventricles, the lesions were not characteristic of rheumatic fever and were not so extensive or diffuse as to constitute an inflammatory myocarditis. Such cases have been rarely reported in childhood and youth, but are more common in later years. In the latter group, the lack of evidence for the cause of the congestive failure and cardiac hypertrophy is often ascribed to an unrecognized hypertension or to arteriosclerosis of the smaller coronary arteries. Consequently studies which eventually might be helpful in explaining the cause of the disease are frequently neglected. For a review of this subject reference may be made to the papers of Levy and Rousselot (2) and Levy and Von Glahn (3), (4).

Since 1946 two more youths aged 22 and 21 died of congestive heart failure at the Philadelphia Naval Hospital and at autopsy hypertrophy of the heart was not explained either clinically or anatomically. It is likely, therefore, that the disease is not so rare at this age as would be surmised from the scarcity of case reports and that more cases will be encountered in other naval hospitals. Consequently these cases are being reported because the cause is still obscure and because the study and recording of such cases is important for the naval service.

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CASE REPORTS

Case 1.—Clinical history: H. E., a white male, age 22, was admitted to the hospital on 7 July 1947 complaining of shortness of breath. He was in good health until 5 days before, when he began to cough. He attributed this symptom to a "cold." The next day he had transitory severe dull epigastric pain not aggravated by breathing or coughing. Two days before admission he first noticed shortness of breath even on mild exertion. He had no other symptoms and his past medical history was not revealing. So far as could be ascertained, he had no previous symptoms which could be ascribed to rheumatic fever.

On admission he did not appear to be dyspneic or seriously ill. Temperature was 101° F., pulse 112, and blood pressure 100 systolic and 82 diastolic. He was thought to have an acute respiratory-tract infection and possibly pneumonia of the upper lobe of the right lung. Several days after admission, however, a roentgenogram of the chest showed no abnormalities of the lungs except for increased vascular markings and a small collection of fluid in the left costophrenic angle. The heart shadow was diffusely enlarged and it was thought that both ventricles were increased in size. Although there were no murmurs and the joints were normal, the preliminary diagnosis was acute rheumatic carditis. Accordingly the patient was treated with salicylates. Low-grade fever persisted and he became progressively dyspneic and cyanotic. Digitalization did not relieve these symptoms and by the end of the third week after admission he was short of breath while at rest in bed. On 9 August he became disoriented, the pulse rate increased to 170 and a gallop rhythm was elicited. He died on 11 August, about 6 weeks after the onset of symptoms.

Laboratory data: Electrocardiograms were variable in character. On 8 July the cardiac rate was 145 and there was right axis deviation. The PR-interval was 0.16 sec.; QRS was 0.08 sec.; T-1 and T-2 were flat and ST-4 was elevated. In subsequent examinations there was a low potential in all leads and P-waves in all precordial leads became inverted. Traces of albumin were repeatedly demonstrated in the urine. There was a slight anemia, but the white blood-cell count and differential were not remarkable. The sedimentation rate, taken only once, was not elevated. The blood Kahn test was negative.

Autopsy

Anatomical diagnosis: Hypertrophy and dilatation of heart; chronic passive congestion of lungs, liver, spleen, and kidneys; bilateral hydrothorax; peripheral edema; widespread recent petechial hemorrhages of peritoneum, myocardium, adrenal, and lymph nodes; thrombosis of prostatic veins; thrombosis (emboli(?)) of several small pulmonary arteries; multiple infarcts of lungs; small foci of lobular pneumonia; acute splenic tumor, slight; diminution of lipoid in adrenal cortices; diminished spermatogenesis.

Body: The body was that of a well-developed, well-nourished young male. There was slight edema of the legs. About 1,500 cc. of clear amber fluid was present in each pleural cavity and a small amount was found in the peritoneal cavity. Only about 35 cc. was present in the pericardial sac and there was no evidence of recent or past inflammation. Numerous recent petechial hemorrhages were seen on the peritoneal surface and small fresh hemorrhages were observed microscopically in one section of the left ventricle, in a peribronchial lymph node, and in the cortex of one adrenal. The veins about the capsule of the prostate were occluded by recent thrombi which showed no evidence of organization. Thrombi which occluded many of the small arteries of both lungs

appeared to be of like age and may well have been embolic from the periphery. Numerous small fresh hemorrhagic infarcts were associated with the thrombotic pulmonary arteries. In addition, there were minute foci of purulent exudate in some sections. The lymphoid tissue of the malpighian bodies was moderately hyperplastic and most of the epithelial cells of the adrenal cortices were devoid of visible lipoids. Spermatogenesis was almost arrested. Nearly all of the organs showed marked chronic passive congestion.

Heart: The heart weighed 500 gm. and all of the chambers were dilated. Although the myocardium of both ventricles was soft, no focal lesions were seen. So far as could be traced, the coronary arteries were patent and normal and the aorta showed only minute atheromatous flecks. The valves were all thin and delicate and showed no lesions.

Microscopically, the muscle fibers of the left ventricle were uniformly hypertrophied, but there were no areas of inflammation, necrosis, or scarring. No lesions were seen in sections from the remaining chambers of the heart.

Case 2.—Clinical history: J. E. C., a white male, age 21, was admitted to the hospital on 2 November 1947 complaining of swelling of the face and ankles. He was well until about a month before when he acquired a "cold" accompanied by persistent cough and pain in the chest. His appetite became poor and he felt weak and listless. About 1 week before admission, he became noticeably short of breath and had several attacks of paroxysmal nocturnal dyspnea. Two days before admission he first noted swelling of the face and ankles. He still had substernal pain on deep breathing. He volunteered the information that his urine was dark and scant. He also complained of vague aches and pains particularly in the lumbar region. Except for a mastoidectomy in 1939, there was nothing of importance in his past medical or family histories.

On admission he was pale and appeared acutely ill. His temperature was 98° F., pulse 90, and blood pressure 95 systolic and 60 diastolic. There was edema of the legs and of the face about the eyes. The neck veins were distended when he sat erect. The liver was palpable 2 finger breadths below the costal margin and there was tenderness to percussion in both costovertebral angles. Râles were numerous at the bases of both lungs posteriorly where there was also evidence of pleural effusion. The heart was enlarged both on percussion and in a roentgenogram of the chest. Premature contractions were numerous, but no murmurs were heard. The highest recorded blood pressure was 110 systolic and 88 diastolic. The patient was thought to have acute glomerulonephritis complicated by congestive heart failure. Although he remained afebrile, his condition became progressively worse. A gallop rhythm appeared and signs of congestive failure increased. He died on 21 November, 19 days after admission, about 7 weeks after the onset of symptoms.

Laboratory data: Electrocardiograms were variable, but in general showed low voltage of QRS and inversion of T-1, T-2, and T-3. PR-interval averaged 0.18 sec. Repeated urinalyses showed specific gravities varying between 1.002 and 1.023. All samples contained moderate amounts of albumin and granular casts but only a few of the samples contained erythrocytes. The blood urea nitrogen rose to 35 mg. per 100 cc. There was slight anemia and leukocytosis. The blood Kahn test was negative. The rest of the laboratory findings were not remarkable.

Autopsy

Anatomical diagnosis: Hypertrophy and dilatation of heart; fenestration of aortic valve; multiple mural thrombi in both ventricles of heart; multiple emboli

and infarcts of lungs, spleen, and kidneys; chronic passive congestion of lungs, liver, spleen, and kidneys; hydropericardium; ascites; peripheral edema.

Body: The body was that of a well-developed, well-nourished young male. There was slight periorbital edema and the lower legs were also edematous. About 800 cc. of clear straw-colored fluid were present in the peritoneal cavity; 125 cc. in the pericardial sac; and 25 cc. in the right pleural cavity. All of the organs showed marked passive congestion. Multiple infarcts of the lungs, spleen and kidneys were of varying age, but microscopically none were organized and in only a few instances were the associated thrombi in the arteries extensively invaded by fibroblasts. The renal parenchyma between the infarcts showed no lesions other than chronic passive congestion.

Heart: The heart weighed 550 gms. The left ventricle was distinctly hypertrophied and all of the chambers were markedly dilated. Numerous small gray-red thrombi were attached to the endocardium between the trabeculae of both ventricles. There were no focal lesions of the myocardium, and the coronary arteries so far as could be traced were patent and normal. Several small fenestrations were situated near the commissures of the aortic cusps. The aorta showed only slight atheromatous changes of the intima.

Microscopically there were no areas of degeneration or inflammation in numerous sections from all four chambers of the heart. The muscle fibers of the left ventricle were diffusely hypertrophied. Most of the mural thrombi of both ventricles were recent and in only a few cases was there evidence of beginning organization.

DISCUSSION

In both cases the age of the patients and the duration of illness, (6 and 7 weeks respectively) were remarkably similar. The onset of illness in each was characterized by symptoms of cough and dyspnea which the patients attributed to "colds." In neither case was the past medical history of significance. Both died of progressive congestive heart failure. In neither case at autopsy was there gross or microscopic evidence of coronary artery disease. In the first case, the disease was clinically attributed to rheumatic carditis although there was no evidence of valvular disease or joint involvement. At autopsy, however, this diagnosis was not substantiated because inflammatory lesions of the myocardium and valves were not demonstrated. The clinical diagnosis in the second case was acute nephritis. The presence of albumin, casts, and erythrocytes in the urine was explained at autopsy by the presence of multiple infarcts in the kidneys, which were undoubtedly embolic from the mural thrombi of the left ventricle, but the renal parenchyma between the infarcts showed no lesions other than chronic passive congestion. The myocardium and valves likewise showed no evidence of inflammation. Although a distinct abnormality, the fenestrations of the aortic cusps were no greater than those often seen in elderly patients in whom the lesions are not assumed to be of functional significance.

It is interesting that mural thrombi were present in both ventricles of the heart in case 2, also in 2 of the cases previously reported (1)

and in 3 of the 10 cases reported by Levy and Von Glahn (4). Doubtless small endocardial or subendocardial lesions may have played a role in the formation of these thrombi, but none were found in the present case.

The cause of the heart disease in these two cases is not only in doubt but may not be identical since anatomical lesions of the heart usually responsible for hypertrophy and congestive failure were lacking. It may be argued that these patients had antecedent hypertension which was obscured by congestive failure during the terminal illness. Although this possibility cannot be denied, it is unlikely in view of the age of the individuals and in view of the fact that even in older patients with hypertension uncomplicated by coronary disease, the first bout of congestive failure is not apt to be fatal. The possible etiologic role of infection other than rheumatic fever is interesting, but it is difficult to understand how such profound consequences might result from an infectious disease of so little importance clinically without inflammatory lesions in the heart.

The occurrence of congestive heart failure of obscure causation in youth, therefore, should prompt thorough clinical and pathologic studies in an effort to find some clue as to the cause or causes of this disease.

SUMMARY

1. The cases of two youths, aged 22 and 21 respectively, who died of congestive heart failure of unknown cause are presented.
2. Although the heart was hypertrophied in each case, none of the usual factors responsible for this lesion were demonstrated either clinically or at autopsy.
3. This disease or syndrome appears to be more common than is usually thought to be the case and efforts should be made to find evidence which will explain the genesis of the cardiac hypertrophy and congestive failure.

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Syphilitic Osteoperiostitis—Skull, Ribs, and Phalanges

Report of a Case

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ALTHOUGH osseous syphilis is described as not uncommon in textbooks on pathology (1) (4) (5) (6) (8) (9), it is rarely seen as a well-developed osteomyelitis. A prominent orthopedist (11) and a roentgenologist (7) both of wide experience, agree that clinically it is an extremely rare entity. Stokes (12) states that osseous symptoms occur in 5 percent of early cases of syphilis but that the exact incidence of skeletal syphilis is unknown because of the lack of comprehensive studies utilizing all available methods of examination for bone lesions. The facts appear to be that with current diagnostic measures cases are diagnosed much earlier than before and that with adequate treatment many of the late findings of syphilis are prevented.

The case reported here came to the attention of the author while engaged in a survey of bone tumors. Keen interest developed when the diagnosis of plasma cell myeloma was noted in the patient who was only 19 years old. This case is especially interesting because it provides a study of the differential diagnosis in osseous syphilis, good histological material, and a basis for observation on the efficacy of penicillin therapy in syphilis.

CASE REPORT

A 19-year-old male reported for treatment in February 1947 complaining of headache, malaise, and fever of 2 weeks' duration.

Past history: He had a negative serologic reaction at the time of his enlistment in 1945. In January 1946 he was treated for gonorrhea with penicillin. In October 1946 he developed a balanitis which was treated with wet dressings, penicillin, and circumcision.

Physical examination: The patient was a young male with moderate pallor and a slight elevation of temperature. Multiple hard nodules were palpable over the cranial vault. The rib cage showed a large tender mass arising from the tenth rib in the right anterior axillary line.

Red cell count, 3,460,000; hemoglobin, 72 percent; leukocyte count, 6,750; polymorphonuclear cells, 70 percent; urine, normal; serum protein, 7.2 grams



Figure 1.—Multiple indefinite osteolytic lesions with generalized blurring.



Figure 2.—Periosteal thickening with lamination and central indefinite area of rarefaction.



Figure 3.—Fusiform swelling ring finger with pathological fracture of mid-phalanx; periosteal thickening of proximal phalanges 2, 3, 4, and 5.

per 100 cc.; nonprotein nitrogen, 24.4 mg. percent; calcium, 10.8 mg. percent; phosphorous, 4.2 mg. percent; and the alkaline phosphatase was reported 4.7 Bodansky units. Sedimentation rate 28 mm. per hour.

Roentgenological examination showed multiple osteolytic areas in the skull and rib cage. In the skull several blurred, poorly defined osteolytic areas were evident in the parietal bones (fig. 1). A degree of regional atrophy near these lesions accentuated the trabecular pattern of the outer table. No proliferative reaction was apparent. In the rib cage fusiform swelling of the tenth rib with periosteal elevation and lamination was seen (fig. 2). Irregular osteolytic areas were visible in the underlying medullary area of the rib. Fusiform swelling of the right ring finger with periosteal thickening and pathological fracture of the mid-phalanx was evident (fig. 3).

Sternal puncture was not diagnostic. Biopsy after rib resection of one lesion showed involvement of the entire rib section with chronic granulation tissue which infiltrated both the subperiosteal space and the marrow cavity. Marked proliferation of periosteal new bone was apparent. New bone spicules surrounded by osteoblasts were seen extending from the cortex and connecting with a horizontal lamina of new bone which appeared separated from the cortex by granulation tissue. This granulation, which also filled the interstices between spicules of new bone which interdigitated to form a fringelike pattern, was composed of lymphocytes and plasma cells which assumed a perivascular arrangement (fig. 4). In the medullary space spicules of dead bone, evidenced by empty

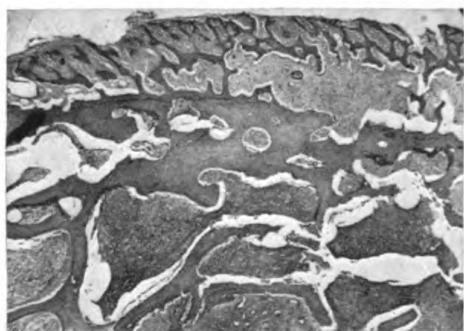


Figure 4.—Periosteal new bone formation with lace-curtain pattern; subperiosteal and intermedullary granulation tissue around cancellous sequestrum. (× 20)

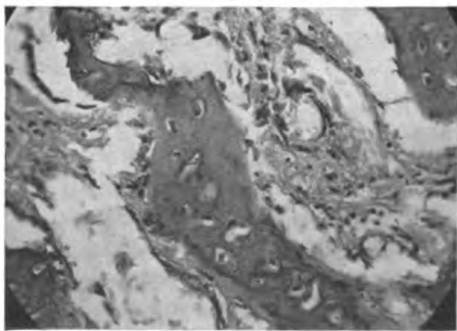


Figure 5.—Periosteal reaction. Note osteoblasts around spicule of new bone; round cell infiltration. (× 250)

lacunae, were surrounded by granulation tissue composed of large numbers of plasma cells, lymphocytes, and foam cells. Perivascular round cell infiltration was evident in some areas (fig. 5). Marked thickening of the walls of the arterioles could be seen, involving both the media and intima (fig. 6). Proliferation of the endothelium was quite definite, some arterioles showing an advanced obliterating endarteritis. No caseation was seen but while cellular structure was maintained the nuclei of the medullary granulation appeared hyperchromatic and the cytoplasm showed abundant vacuolization. Multiple myeloma was diagnosed upon the finding of many plasma cells and the multiple osteolytic lesions.

Subsequently a positive serologic test for syphilis was noted on repeated examinations in March 1947. Spinal fluid examination was reported to have a normal cell count, slight increase in protein, anticomplementary serum, and a gold curve of 1112210000. Specific treatment with 8,000,000 units additional penicillin (totaling approximately 14,000,000 units within 1 year) and mapharsen 0.49 gram accomplished a clinical cure and reversed the serological reaction by June 1947. Roentgeno-

graphic reexamination showed a regression of the osteolytic process and some osseous proliferation about the periphery of the skull lesions. The patient was returned to duty 1 August 1947. The blood Kahn reaction was negative on 1 March 1948.

DISCUSSION

The osseous lesions of syphilis may be understood best by comparing their pathogenesis with that of acute hematogenous osteomyelitis. When organisms, by way of the lymphatics, reach the blood stream they are dispersed throughout the body with the establishment of many foci of infection. Antigens from the infectious agent stimulate the production of antibodies. A definite systemic reaction occurs, sometimes with fever. Commonly a severe anemia is found—formerly called, according to MacCallum (9) a “syphilitic chlorosis.” A moderate lymphocytosis is present. The outcome thereafter depends on the invasive toxic reaction of the spirochete and the resistance of the host aided by specific therapy. Although they act much more slowly and less violently than in osteomyelitis, the same factors are in operation.

CONGENITAL SYPHILIS

In infancy the typical lesion is the pseudoparalysis of Parrot or osteochondritis, usually of the proximal humerus, which comes on in the first few weeks of life and undergoes spontaneous healing by the fifth month. It is characterized by fusiform swelling, excessive pain, and physiological splinting of the part. Concurrently periosteal reaction with production of new bone is marked. Lesions are multiple. Later dactylitis is not uncommon in children.

Radiographic findings consist in broadening of the epiphyseal line with increased density in the deeper layers of cartilage. The zone of provisional calcification is widened with a sawtooth irregular appearance. Juxta-epiphyseal atrophy and periosteal reaction of the diaphyses are common findings.

Histologically at the epiphyses the orderly process of enchondral ossification is inhibited by the toxins of the spirochete. Chronic granulation tissue showing lymphocytes with a tendency toward perivascular infiltration is seen. The deeper layers of cartilage run to-

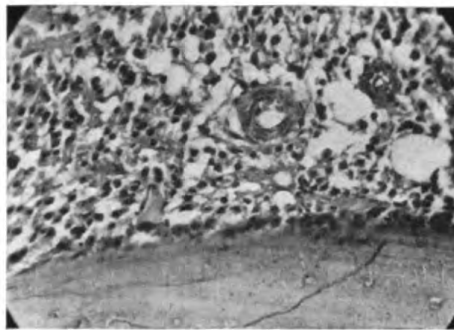


Figure 6.—Chronic granulation tissue from medullary area. Lymphocytes, plasma cells and foam cells; dead bone evidenced by empty lacunae; thickening of arterioles with marked endothelial proliferation producing endarteritis obliterans. ($\times 250$)

gether with an anastomosing latticework effect. In the adjacent areas trabeculae are thin and sparse. Osteoblasts are lacking.

Later periostitis with new bone formation represents the healing stage of the early lesions. It is characterized by osteoblastic activity with membranous bone formation similar to the involucrum of osteomyelitis. A degree of osteitis underlies these areas. Small areas of destruction are seen. However, the proliferative response of syphilis is more marked than the destructive reaction. This is the process of the saber shin and dactylitis of late congenital syphilis.

ACQUIRED SYPHILIS

This type of the disease, so far as pathologic bone change is concerned, has a similar pathogenesis to that of congenital syphilis, the response being different because of the change of the bones due to skeletal maturation. Contrary to popular belief bone syphilis as a secondary manifestation within the first few months of the disease is not infrequent in the natural course of the disease. Osteomyelitic foci are established by blood stream dissemination. Clinically osseous syphilis is characterized by a deep boring osteocopic pain and a degree of systemic reaction. Generalized malaise with backache is frequent. Headache is common. Tender swollen areas develop in bones of membranous and cartilagenous origin. According to Geschickter and Copeland (6) the cranium, ribs, sternum, and tibia are most frequently involved. The skin is usually not involved until late when gummatous degeneration occurs. With this stage the acute reactions and pain subside. The serologic test is not always positive with bone lesions.

Pathologically the earliest signs are the development of a periosteal node and an underlying diffuse osteitis. The periosteal reaction is most prominent; perpendicular and horizontal spicules of new bone interdigitate to produce a lacework pattern of thickened periosteum. Beneath the periosteum and in the subcortical marrow spaces a chronic granulation tissue containing lymphocytes, plasma cells, and foam cells develops. Spicules of dead cancellous bone form sequestrae; cortical bone shows less tendency to sequestrate in syphilis. Perivascular round cell infiltration is prominent as an early sign of the obliterating endarteritis characteristic of the general pathological process of syphilis. The adventitia is surrounded by inflammatory exudate, the media shows atrophy of the muscular element with replacement of the elastic fibers by scar tissue, and the intima becomes markedly thickened by the proliferation of endothelial cells. When this becomes advanced caseation necrosis develops as the result of ischemia. Development of foam cells is followed by loss of cellular

structure by fragmentation but with retention of pyknotic nuclei which maintain their tinctorial reaction for long periods. Treponema are less numerous than in the active osteomyelitic phase of the process. Giant cells are absent. This constitutes the characteristic pathologic changes observed in gumma—(an area of caseation necrosis surrounded by osteomyelitis and chronic granulation tissue).

Roentgenological signs are absent in the early stages. Later a periosteal reaction consisting of elevation, thickening, and lamination develops, associated with a variable degree of medullary rarefaction. Radiographic evidence of sequestration is not seen, since it is of microscopic proportion in the cancellous part of the bone. From a radiographic viewpoint Brailsford (5) classifies the skull lesions as follows: (a) multiple osteolytic areas of indefinite outline; (b) osteoporosis of the outer table of the skull; (c) generalized blurring of the entire skull detail; and (d) isolated gummata. Lesions are usually multiple and polyostotic. Periosteal new bone reaction is almost always evident as the most prominent finding. Dactylitis, though not uncommon in children, is rarely seen in adults.

DIAGNOSIS

The diagnosis depends on the *history*, the *serologic reaction*, and the test of *specific therapy*. A high index of suspicion and a knowledge of cutaneous syphilis are very useful adjuncts to diagnosis. Routine serologic tests are mandatory. From a roentgenographic point of view syphilis is preponderantly a constructive osteoplastic process. Osteolytic areas are irregular. More than one bone is usually involved. Biopsy may be suggestive but is not diagnostic. According to Stokes (12) the surgical error in bone syphilis was 21 percent. One case out of five was operated upon without the preoperative diagnosis of syphilis. Such practice leads to delay in diagnosis and treatment and to exposure of the operating room personnel to unforeseen danger.

In the differential diagnosis, primary and metastatic tumors, myelomatosis, tuberculosis, eosinophilic granuloma, yaws, leprosy, Paget's disease, scurvy, and osteomyelitis have to be considered. The combination of marked bone proliferation and minimal destruction frequently has led to the erroneous diagnosis of primary osteogenic sarcoma or Ewing's tumor. The multiplicity of lesions in syphilis, however, is strong evidence against such a mistake. Myeloma and metastatic lesions may be differentiated by their occurrence in the middle- and old-age group and by the characteristic of more clear-cut osteolytic lesions. Myeloma especially shows no proliferative osseous reaction; according to Ponseti (10) it shows the most clear-cut outline of all osteolytic lesions. Eosinophilic granuloma can be diagnosed by

biopsy and exclusion of other causes for granulomata. Yaws was excluded in this case because the patient had never traveled beyond Oahu. Tuberculosis and leprosy have specific tests and radiographic characteristics for diagnosis. Radiologically, tuberculosis is predominantly destructive in character with a minimal osteoplastic response. Bone lesions in leprosy are limited to the small bones of the extremities and show concentric absorption, characteristically, instead of periosteal thickening. Paget's disease may be excluded by its high phosphatase value. Osteomyelitis can be diagnosed specifically by bacteriological methods. Scurvy for practical purposes is limited to infancy after the age of 5 months.

CONCLUSION

In retrospect it is clear that the diagnostic signs in this case were present but that they were at first overlooked. Following venereal infection the serologic follow-up was not adequate. No doubt penicillin therapy obscured the clinical picture and retarded the early diagnosis of syphilis. Also, the periosteal reaction and diffuse irregular osteolytic lesions in a male age 19 argued for syphilis instead of myeloma which occurs in the middle- and old-age group and is entirely osteolytic.

It seems to be fairly well established by the evidence at hand that this case represents an acquired, acute, syphilitic osteoperiostitis occurring within the first year following infection, in spite of *intermittent* penicillin therapy of considerable intensity.

From the health record and the nurses' notes on the hospital chart it was possible to compute that approximately 6,000,000 units of penicillin were administered to this patient for treatment of gonorrhea, balanitis, and as surgical prophylaxis, prior to the establishment of the diagnosis of syphilis. In spite of this, the lesions were progressive and the serologic reactions became positive.

Intensive massive therapy, after diagnosis, with 8,000,000 units of penicillin over a 10-day period together with only 0.49 grams of mapharsen reversed the serologic reaction and affected a clinical cure.

The necessity for never-ceasing vigilance, a high index of suspicion, routine serologic determination, and adequate follow-up is again brought to the attention of the profession.

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Oro-Laryngeal Tuberculosis

Report of a Case

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PULMONARY tuberculosis is not recognized in some cases until there are pharyngo-laryngeal complications. However, it is uncommon for tuberculosis to invade the larynx without preceding signs of pulmonary involvement associated with a history of hemoptysis or pleurisy (1). The lack of premonitory symptoms is unfortunate because the frequency of laryngeal tuberculosis is believed to increase with the duration of the primary lung focus. The life expectancy in pulmonary tuberculosis complicated by laryngeal involvement is reduced approximately 50 percent. The incidence of laryngeal complications in pulmonary tuberculosis varies from 3 to 25 percent (1).

Tuberculosis of the tongue is another complication in advanced pulmonary tuberculosis that is frequently not recognized. Only 400 cases have been reported since 1761 (Morgagni) (2). The incidence of lingual tuberculosis as reported in the literature varies from 1 to 19 percent. The prognosis, in the presence of laryngeal tuberculosis, is grave because of the dysphagia and resulting debility and inanition. Oral tuberculosis may manifest itself as: ulcer, granuloma, tuberculoma, fissure of the tongue, and inflammations such as glossitis (3).

CASE REPORT

A 52-year-old male was admitted on 21 October 1947 complaining of glosso-dynia and odynophagia of 3 months' duration and hoarseness of 1 month's duration. He had no cardiovascular, respiratory, gastro-intestinal, or genito-urinary complaints.

Past history—In 1936 he was retired because of hypertensive cardiovascular disease. He stated that he had an attack of diarrhea and noticed blood in his stools in June 1945. Routine roentgenograms taken at that time indicated the left bronchovesicular markings to be hazy and thickened. The subapical markings showed increased bronchial drainage (fig. 1). Otherwise the physical examination and laboratory findings were negative.

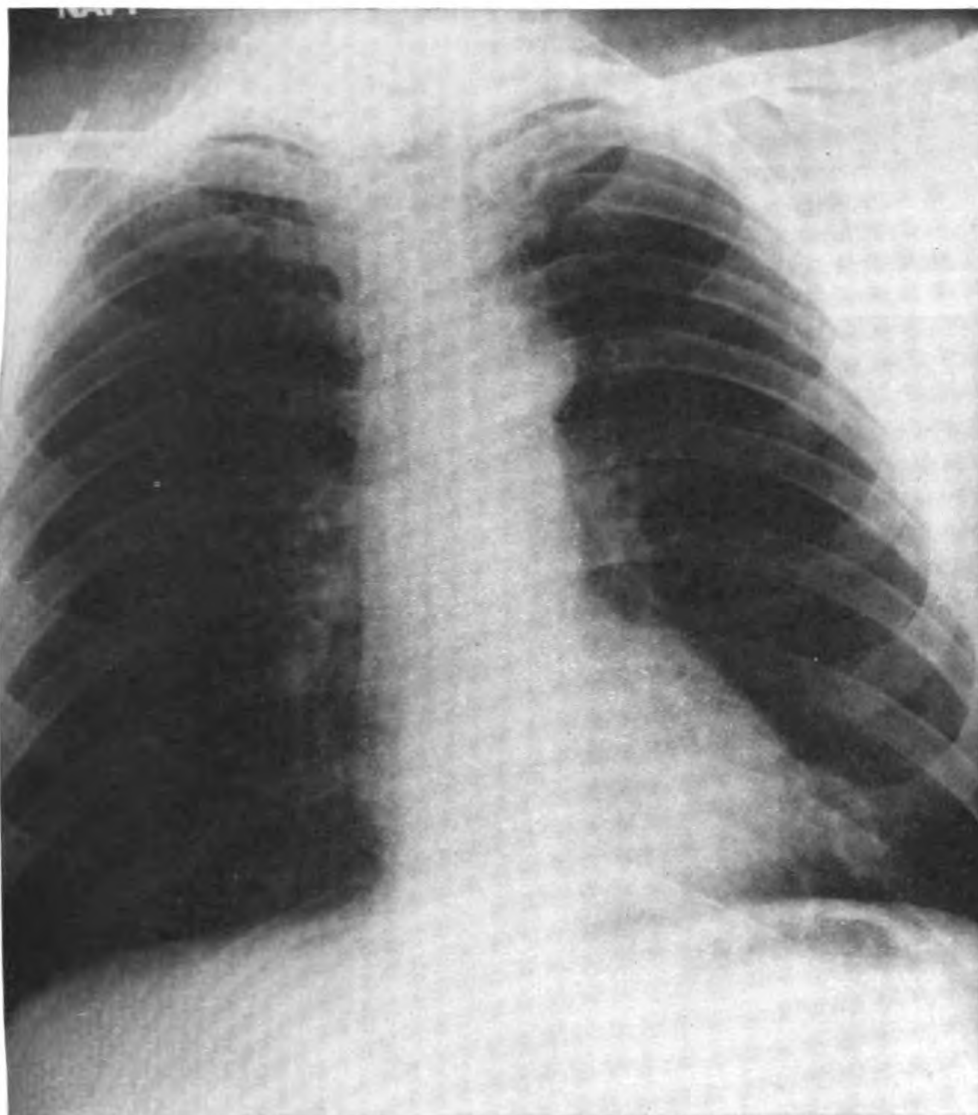


Figure 1.—(June 1945) Roentgenogram indicating moderate obliteration of left costophrenic angle. Thickened, hazy, left inferior bronchovesicular markings with confluent density. Left subapical markings reveal increased bronchial drainage. (Note several concurrent old fractured ribs with moderate callus formation.)

In November 1946 he was admitted with a complaint of persistent intermittent diarrhea, increasing in severity. Stool examinations for parasites and blood and urine studies were completely negative. Physical findings were negative except for hypertension. The cause of the diarrhea was undetermined, and he was discharged in February 1947.

Habits—He drank one pint of whiskey and smoked one to three packages of cigarettes daily.

Physical examination—Patient appeared older than his stated age. Blood pressure was 168/100. Daily temperature varied from 98.6° to 99.4° F. Mouth revealed a stomatitis and glossitis. The entire dorsum of the tongue was inflamed and sharply furrowed. Posteriorly, there was some indication of

hyperplasia. Sublingually, there was a hemorrhagic area approximately 2 by 3 cm. Indirect laryngoscopy revealed a thickened, acutely inflamed, low-hanging epiglottis. The arytenoid areas, aryepiglottic folds, and vocal cords were subacutely inflamed and edematous. There was no cervical adenopathy. Examinations of the cardiovascular, respiratory, gastro-intestinal and genito-urinary systems were negative.

Morning sputums were repeatedly negative for *Mycobacterium tuberculosis*; blood Kahn and urinalysis negative; the white blood cell count, 12,000; and sedimentation rate 30 mm. per hour.

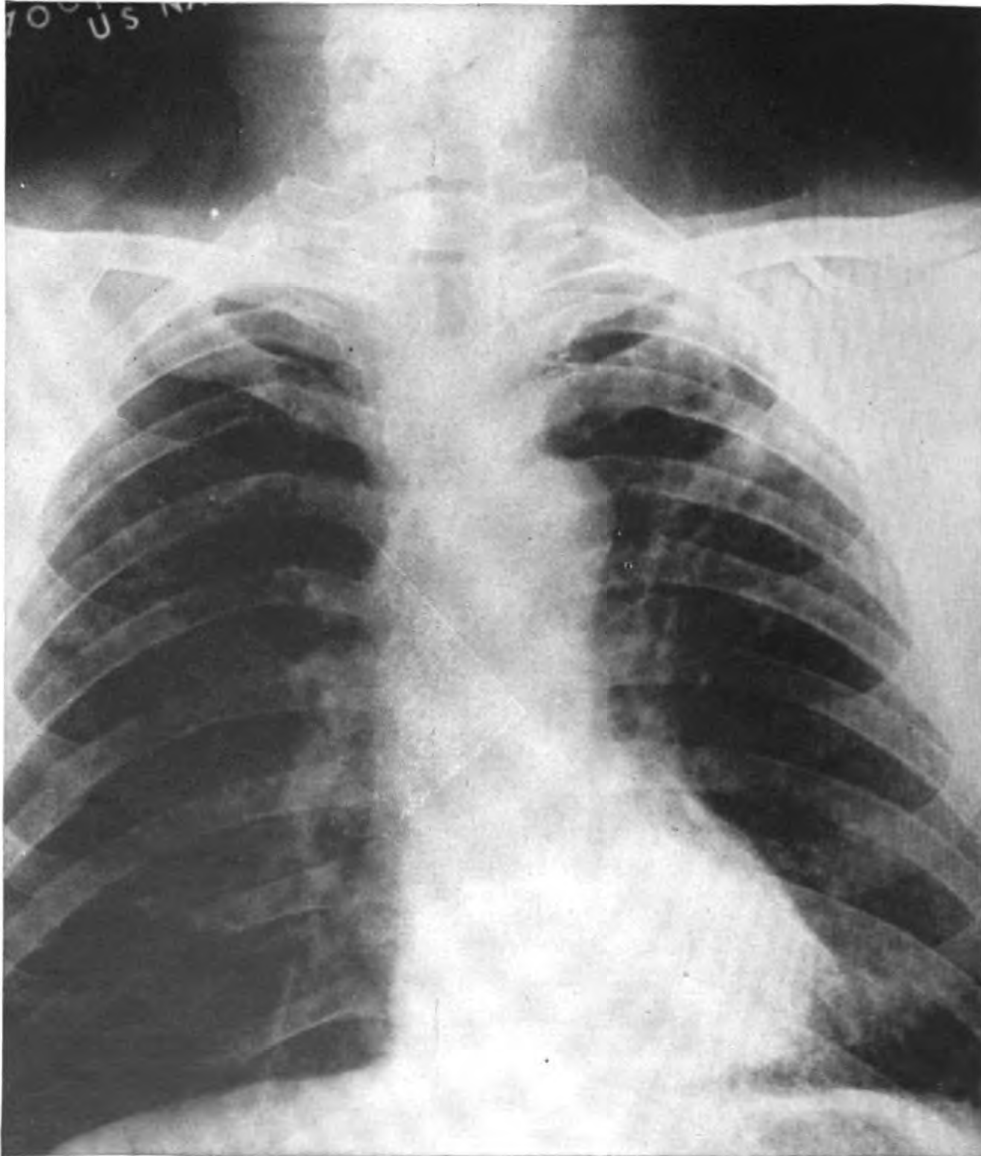


Figure 2.—(October 1947) Roentgenogram indicating hazy and indistinct left dome of diaphragm. Areas of confluent density left lower lung field. Left upper lung field shows thickened, hazy, superiorly radiating bands of density, infraclavicular cavitation, and exudative processes. Early exudative infection of right upper lung field.

Radiologic studies revealed confluent densities suggestive of pneumonitis in the left lower lung field. The left upper lung field had thickened hazy bands of density. There was an area of cavitation in the left anterior first rib interspace. This had the appearance of an early caseous or exudative process. The right lung markings were hazy and accentuated and extended into the peribronchial tissues. This was most marked in the right upper lung field (fig. 2).

Laboratory examinations of the secretions obtained during direct bronchoscopic aspiration revealed many tubercle bacilli.

Treatment—Consisted of complete voice rest and streptomycin hydrochloride administered parenterally and by nebulization; dosage 2 grams of streptomycin hydrochloride (2,000,000 S units) per 24 hours divided into 8 equal doses and given every 3 hours. For nebulization, 0.5 gram of streptomycin hydrochloride was dissolved in 30 cc. of normal saline solution and 3 cc. of solution was administered each hour for 10 hours daily. This continued for 40 days. (A total of 100 grams of streptomycin hydrochloride was used.) Thoracoplasty was performed on 28 December 1947. Streptomycin was continued. Examination of biopsy specimen from posterior aspect of the tongue showed evidence of tuberculosis.

Course—The patient progressed satisfactorily for 4 months when a small area of redundant, keratotic tissue was observed on the left anterior third of the vocal cord and anterior commissure. A specimen taken for biopsy indicated a Grade 3 epidermoid carcinoma. A laryngectomy was subsequently necessary.

Prognosis—Guarded.

DISCUSSION

From the vantage point of discussing this case in retrospect, there seems little doubt that the persistent diarrhea first encountered was tuberculosis enteritis secondary to ingested infected sputum. Tuberculous enteritis may persist for years (4). Auerbach (5) in a pathologic study found in a series of 304 patients with laryngeal tuberculosis, evidence of intestinal tuberculosis in 268 (88.1 percent). He believes that in most cases intestinal tuberculosis precedes laryngeal tuberculosis. In 54 percent he found extensive and deep-seated ulcerations of the intestinal tract. In the case presented no lesions pathognomonic of intestinal tuberculosis were found by proctoscopic examination except mucosal inflammation that was probably proportional to the amount of infected sputum ingested. The patient never coughed which probably accounted for the fact that no acid-fast organisms could be demonstrated in morning sputums until they were obtained directly by bronchoscopic aspiration. Physiologically a productive cough depends upon the tussive squeeze and bechic blast. It is commonly known that coughing causes compression of the invaded lobe by the powerful thoracic muscles and forces out the infected secretions.

The roentgenograms taken in 1945 (fig. 1) indicate a low grade peribronchial and bronchial infection. In view of this observation, the patient should have been told to return for frequent serial studies. Britten (6) in a comprehensive review states that tuberculosis was second on the list of diseases causing death in the Navy during the

period 1942 to 1945. He further stated that in some cases a roentgenogram of the chest may disclose little or no evidence of disease only to have the patient die of a tuberculous process within 1 to 4 years. He reiterates the warnings of the standard textbooks that there is nothing specific in the early symptoms and signs of tuberculosis.

It is interesting to note that despite the painful lesions of his tongue and epiglottis, this patient did not seek aid until hoarseness ensued. The psychic shock of hoarseness and vocal change often prevents the patient from further delaying medical care. Hoarseness, although a common symptom, is not pathognomonic of laryngeal tuberculosis nor is the voice alteration proportional to the severity of the disease but depends upon the degree of phonatory apparatus involvement (1).

Although the patient used large amounts of alcohol and tobacco, it is still controversial as to the extent which alcohol and tobacco are contributing factors in laryngeal tuberculosis. They may cause acute laryngitis and simulate the early hyperemia of tuberculosis laryngitis. Jackson and Coates (7) state that alcohol and tobacco should be absolutely forbidden in any case of pulmonary tuberculosis in which there is a potential laryngeal complication. Lederer (1) cites the rapid pulmonary course of the primary complex and the absence of irritating alcohol and tobacco as reasons for the low incidence of laryngeal tuberculosis in children. Ballenger (8), however, states that alcohol and tobacco do not seem to be factors of importance in tuberculosis of the larynx.

The use of streptomycin will doubtlessly modify the prognosis of tuberculous laryngitis. Figi, Hinshaw, and Feldman (9) reported a case cured in 6 weeks using streptomycin intramuscularly and locally as a laryngeal spray. The patient, however, had minimal active pulmonary tuberculosis. In the case report presented here there was some general improvement with lowering of the sedimentation rate and of the temperature following the use of streptomycin. There appeared to be slight amelioration of the throat complaints. Examinations of the larynx and thoracic roentgenograms revealed no changes. The Veterans' Administration and the Army and Navy, in a joint investigation of streptomycin (10) reported that the best use of streptomycin in the treatment of pulmonary tuberculosis might be as an adjunct to other measures, especially in acute phases or complications, or in preparation for surgical procedures. It was generally agreed that streptomycin should not be used in minimal lesions, and that it exerted little or no therapeutic effect on old fibrous or caseating lesions, or on terminal types of pulmonary tuberculosis.

It is unfortunate that this patient also developed a superimposed squamous cell carcinoma. In a significant number of cases, tuberculous or syphilitic lesions of the larynx may coexist with cancer, indicating

that these chronic granulomatous lesions are related to malignancy. The tuberculous process precedes the carcinomatous degeneration (11). Responsibility continually rests on the clinician for the early detection of pathologic processes so that the patient may benefit from prompt and early therapy.

SUMMARY AND CONCLUSIONS

1. A case of complicating oro-laryngeal tuberculosis without preceding pulmonary symptoms or physical findings suggesting moderately advanced pulmonary tuberculosis has been presented.

2. Serial roentgenograms of the chest are indicated at frequent intervals in all cases of peribronchial and bronchial infection in order to detect and forestall the insidious progression of tuberculous lesions.

3. Despite painful oro-pharyngo-laryngeal symptoms, the patient frequently does not present himself for treatment until hoarseness occurs. A high index of suspicion of inflammatory processes in these areas should be maintained.

4. It is again demonstrated that the discovery of laryngeal tuberculosis does not preclude the possibility of a coexisting lesion, which was a carcinoma in this case.

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Repositioning of the Mandible by Adjustment of Occlusion

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MANDIBULAR malposition usually predisposes to advanced periodontal disease and is responsible for poor facial form and esthetics. Establishment of a new mandibular position often will prove to be a determining factor in arresting periodontal disease as well as in improving facial form. Orthodontic treatment at an early age in most cases will solve the problem but such treatment is impractical in a large majority of adults. A number of cases of mandibular malposition have been treated successfully by selective grinding of the involved teeth. The following case of correction of mandibular protrusion is reported as an example.

CASE REPORT

A general court martial prisoner appeared at the dental clinic of the United States Naval Disciplinary Barracks, Portsmouth, N. H., complaining of bleeding gums, tooth mobility, and extreme sensitivity of the labial surfaces of both upper central incisor teeth. Examination revealed that the lower incisors were abrading the labial surfaces of the upper incisors in such a manner that the incisal-third areas of both upper teeth had been extensively denuded of enamel (figs. 1, 2, and 3). It was immediately apparent that a severe mesiocclusion was responsible for the patient's complaints (fig. 1).



Figure 1.—Before treatment. Position of the teeth in habitual centric position.



Figure 2.—Before treatment. Position of teeth with an edge-to-edge bite. Note the enamel denudation of the upper central incisor teeth.

The patient was directed to perform the various mandibular excursions and was able to demonstrate an edge-to-edge bite easily (fig. 2). This was significant, because it indicated that the condyles of the mandible could be further retruded in the glenoid fossae of the temporal bone. It was decided, therefore, to facilitate movement of the mandible distally by selective grinding of the involved teeth. Immediate therapy consisted of the application of formalin solution to the exposed, hypersensitive dentine.

The next objective was the establishment of balanced occlusion. This course of treatment continued through several months and involved the following methods. The anterior teeth were ground so that, while keeping the median line relationship, the posterior teeth made contact. The forms and positions of the anterior teeth were kept in mind, and the anterior teeth were ground to an edge-to-edge bite (fig. 4). The posterior teeth were then studied and selective grinding was continued until the objective of general occlusal balance had been reached. Articulating paper and sheet wax impressions were employed to indicate the occlusal areas which were making premature contact. After a centric position had been established, and having instructed the patient to utilize this new position, the various mandibular excursions were considered. A working lateral position was determined and the involved teeth were carefully ground to insure a smoothly executed mandibular excursion to the left and to the right. It was found that in this new centric position the extent of lateral excursion was not so great as it previously had been. It was felt that greater latitude of excursions would become possible gradually. Routine periodontal treatment, including scaling, curettage and tooth brush instruction, also was carried out and a very satisfactory effect was obtained (figs. 4 and 5).

SUMMARY

1. A patient with a severe case of functional mesiocclusion, which caused a periodontal disorder and tooth sensitivity, was treated. Repositioning of the mandible by adjusting the occlusion of the teeth was the method employed to achieve the desired result.



Figure 3.—Before treatment. Note the condition of the upper incisor teeth.



Figure 4.—After treatment. Position of the teeth in the newly established centric position.

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Figure 5.—After treatment had been completed. Note the improved gingival tone and appearance.

Scleredema Adultorum

Report of a Case

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JULIAN LOVE, *Captain (MC) U. S. N.*

IT WAS the authors' privilege recently to observe a patient with chronic scleredema adultorum of Buschke. This served as a stimulus for a review of the literature on this relatively uncommon disease and its related disorders. Cases have been reported with a duration up to 15 years. Our patient has had scleredema for 8 years with no signs of improvement. This case will be presented with a short review of the literature and also a discussion of dermatomyositis and scleroderma which were involved in the differential diagnostic possibilities.

CASE REPORT

J. M. L. a 21-year-old white unmarried male was admitted to the hospital on 19 April 1948 for investigation of a possible hypothyroid state because of a complaint of fatigue. As an outpatient he was found to have a basal metabolism rate of minus 23, but after admission two subsequent tests were found to be within normal limits. No adequate explanation was found for his fatigue. Attention was then directed to his skin.

The skin condition had its onset following an episode of scarlet fever at the age of 14. The subjective sensation was that of tightness particularly about the face with no other complaints referable to the skin. The patient had had some difficulty opening his mouth widely enough for dental work to be done, but there was no difficulty in eating. There was no restriction of motion of any joints, nor any lack of expansion of the rib cage. The skin changes reached their maximum extent within a few weeks following the onset and have shown no significant change since that time (8 years).

A review of the past history revealed only the usual childhood diseases and scarlet fever. For the past 4 years there have been transient episodes of albuminuria, unassociated with any demonstrable kidney disease. At the time of the present admission a trace of albumin was found in the urine on one occasion. No albumin was found on two subsequent examinations of the urine and the microscopic examination was repeatedly negative.

Physical examination revealed a thin but well-developed and well-nourished young white male. He was ambulatory, afebrile, and not acutely ill. The significant physical findings were limited to the skin. The skin of the face, neck, trunk, and upper extremities as far as the wrists was glossy, taut, thickened, and firm to the touch. It could not be picked up between the thumb and forefinger and there was no pitting on pressure. The skin of the face was smooth with

obliteration of the normal skin markings, and was rather greasy. There were no abnormalities of the hair or nails and no diminution of sweating.

Most laboratory examinations including roentgenograms of bones, heart, and lungs; electrocardiogram and basal metabolism rate were normal. The blood cholesterol was elevated on two occasions.

Biopsy—There was marked enlargement of the collagenous bundles in the corium, and many similar swollen bundles were present in the subcutaneous fatty layer. There was also moderate granular degeneration of some voluntary muscle fibers.

The patient's hospital course was uneventful. No specific therapy was given and the patient was discharged on the twenty-ninth hospital day.

DISCUSSION

O'Leary (1) groups scleredema, scleroderma, and dermatomyositis together as the "dermatoscleroses," but the similarity of these three conditions is mostly pathologic in nature. Clinically the three are dissimilar, particularly with regard to their prognoses. Scleredema is a benign disease, but the other two are likely to be crippling (scleroderma) and/or fatal (dermatomyositis).

Scleredema adultorum was first reported by Buschke in 1902. The first report in American literature was by Epstein in 1932 (2). Since that time there have been occasional articles, notably that by O'Leary (3) with a report of 15 cases in 1940. Scleredema is a benign, self-limited disease which occurs somewhat more often in children than in adults and usually follows one of the exanthemata or upper respiratory infections.

Epstein's description of the disease is an excellent one. He states that the process is characterized by progressive induration and swelling of the deeper portions of the skin and subcutaneous tissues (fig. 1). As a result, the skin becomes hard and rigid and cannot be lifted up into folds. The normal markings are obliterated giving a smooth, shiny appearance. On palpation, the skin is of boardlike consistency and does not pit on pressure. Except for this, there are no other changes in the epidermis. Sensation is unchanged; sweating may be normal or slightly decreased; there is no loss of hair; there are no changes in pigmentation, and no signs of inflammation. When the process subsides, the skin returns completely to normal. Atrophy is never seen.

The induration begins usually at the nape of the neck and spreads

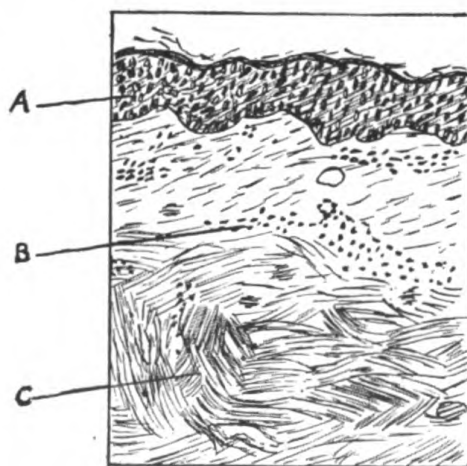


Figure 1.—Scleredema: A, normal epidermis; B, mild perivascular infiltrate; and C, swollen collagen bundle.

quite rapidly to the front of the neck and the face. It then progresses downward over the back and chest, becoming preceptibly less marked over the lower portions of the trunk. The pelvic girdle and the lower extremities are affected less often and affected to a lesser degree than are the shoulders, neck, and face. The hands are seldom involved, although one of O'Leary's cases showed some edema of the hands (3). The feet, however, are never involved. A transient erythematous eruption occasionally precedes the development of the induration. The rigidity of the skin of the face and eyelids produces a masklike appearance. The patient frequently has difficulty in opening his mouth, and movement of the neck is restricted. There may be some difficulty in flexing and extending the limbs. Occasionally, owing to the rigidity of the wall of the chest, respiration may be interfered with but never to a grave extent (2).

The treatment of scleredema is largely symptomatic. Strenuous measures are not indicated in such a mild disease. Radiant heat, ultraviolet irradiation, and massage usually suffice for relief.

The prognosis is excellent. The process usually recedes within the first year, but the duration may be from 8 days to 15 years. There are no sequelae. Laboratory investigation reveals nothing of note. Histologically there is little or no change in the epidermis. A moderate perivascular infiltration of fibroblasts and round cells is found in the corium. The collagen bundles of the corium and the subcutis are enlarged to several times their normal size, thus producing a thick layer of collagenous tissue. The histochemical changes

occurring in connection with these pathologic alterations are not known, and consequently there is no factual evidence available as to the pathogenesis of the disease.

Scleroderma occurs in three different forms: diffuse scleroderma, acrosclerosis, and morphea or circumscribed scleroderma. Andrews (4) provides a graphic description in the latest revision of his book. He states that the disease is characterized by the appearance of circumscribed or diffuse, hard, smooth, ivory-colored areas which are immobile upon the underlying tissues and are generally surrounded by violaceous margins (fig. 2).

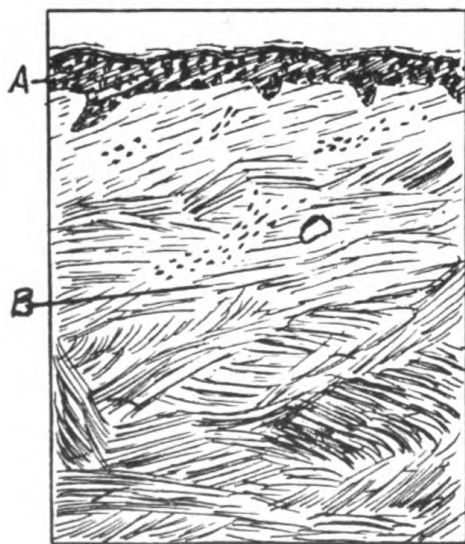


Figure 2.—*Scleroderma, late stage: A, atrophic epidermis; B, sclerotic, thickly packed collagen.*

In diffuse scleroderma the earliest changes occur insidiously upon the face and hands, and in more advanced stages these parts become hide-bound so that the face is expressionless; there is difficulty in opening the mouth, and the hands are clawlike (sclerodactylia). Commonly a feeling of stiffness is the earliest subjective change noted. In certain cases, however, particularly those involving the extremities, neuralgic and arthritic pains or paresthetic sensations are the first signs. In the atrophic stage, the skin becomes thin, harder, and more firmly bound down to the underlying tissues. Normal lines are obliterated and the face may present a corpselike appearance. The fingers may become tapered and fixed, and the entire limb may become reduced in circumference by several inches. Ulceration may occur over bony prominences. Disturbance of the functions of the skin as a rule is slight. There may be diminution in sweating. Hyperesthesia and pruritus are relatively uncommon. The hair generally is thin, or may fall out completely in the affected region. There may be extensive involvement of the skeletal muscles in the form of myosclerosis, and also similar involvement of striated muscles or various internal organs including the cardiac muscle and the muscles of respiration and deglutition.

Diffuse scleroderma is not limited to the skin and subcutis but is primarily a disease of the connective and vascular tissues throughout the body (collagen). The muscles are frequently involved, and this involvement may be quite independent of any change in the overlying skin or subcutis. Three stages characterize the course of the disease: edema, induration, and atrophy. Hence, in cases in which the disease begins acutely, the early combination of slight fever, general malaise, edema, and erythema of the skin, and muscular pains and tenderness may confuse the clinical picture with that of dermatomyositis. Unfortunately biopsy and histologic study of the tissues is not liable to provide any help in the early stages because the microscopic picture is similar in both conditions. Sections of skin taken from patients with either disease will show edema and perivascular infiltration in the corium and some edema and loss of cross-striations in the muscle fibers. In the later stages of scleroderma when the skin becomes sclerotic and the diagnosis is apparent the histologic picture also becomes distinctive. In this stage there is much proliferation of connective tissue fibers with subsequent sclerosis and atrophy in the skin and subcutaneous tissue. There is less inflammatory infiltration and the blood vessels become sclerotic, sometimes becoming completely occluded. The muscle fibers may be involved in the degenerative process, usually in proportion to the degree of sclerosis in the vascular and connective tissue (5).

Acrosclerosis is a combination of Raynaud's disease with scleroderma of the distal parts of the extremities and of the face and neck. Like Raynaud's disease it occurs chiefly in women during adolescence or adult life. It begins with symptoms of Raynaud's disease, with blanching and intermittent arteriolar spasm, followed in a few years by sclerodactylia and later by the changes that usually occur in the advanced stages of the progressive generalized type of scleroderma.

Morphea is a term commonly applied to circumscribed scleroderma which may occur in several forms. The most common of these are scleroderma in plaques, in sheets, in bands, in spots, and in the form of supple, nonindurated, rose and lilaceous macules. The early inflammatory stage is followed by the development of yellowish or ivory-colored discrete patches or plaques in which the skin is hard, dry, and smooth. The patches are, as a rule, oval or linear and arise chiefly on the chest, scalp, and face. Within the patch the skin loses its elasticity and when picked up between the thumb and index finger feels rigid. The guttate variety is characterized by multiple small rounded atrophic macules, sometimes surrounded by purplish-blue zones. The lesions occur chiefly on the upper part of the chest and neck and are arranged in clusters or in lines (4).

The pathogenesis of scleroderma is not known. The disease is more common in women than in men and usually begins in the thirties. Some cases are associated with thyroid dysfunction.

Treatment is largely symptomatic. A warm dry climate is advised, and a well-balanced diet supplemented as necessary by tonics

and vitamins. Vitamin D, foreign protein therapy, pancreas, thyroid, and ovarian extracts, acetylcholine, bismuth, ammonium chloride, a ketogenic diet, and neostigmine have all been thought to be of benefit in certain cases. Local heat and massage are thought to be of value in circumscribed types.

Dermatomyositis is described by Brock as a "nonpurulent, non-hemorrhagic type of polymyositis in which there is, in addition, an inflammation of the skin" (5). The disease usually starts insidiously with malaise, headache, and fatigue, followed soon after by muscular pain and weakness and

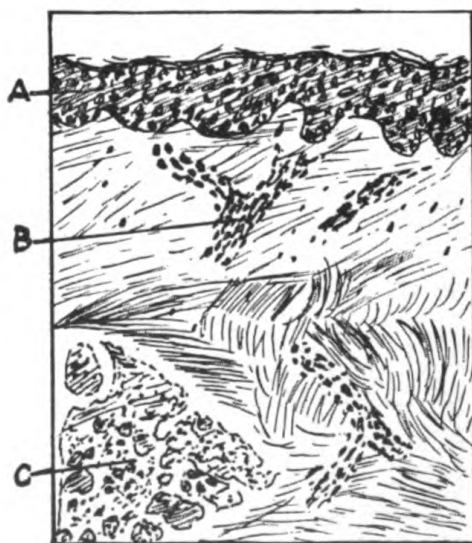


Figure 3.—*Dermatomyositis*: A, normal epidermis; B, heavy perivascular infiltrate; and C, muscle degeneration.

an erythematous eruption overlying the affected muscles. The erythema is frequently accompanied by edema. If the onset is on the face as is the usual case, a masklike appearance results due to the swelling of the muscles and the soft tissues (fig. 3).

The process may strike any muscle or group of muscles, but the face, neck, arms, and thighs are most frequently affected. On the extremities the proximal portions tend to be more seriously affected than the distal. Sometimes the process may spread from one group of muscles to another. Pain in the muscles, particularly on motion, is the most prominent symptom. Tenderness to palpation is found over the body of the muscle and at the tendon attachments, not in the joints.

Dermatomyositis may be acute, subacute, or chronic. In the acute and subacute cases there may be fever, splenomegaly, lymphadenopathy, neuritis, and psychic disorders in the form of delirium or hallucinations. Death may occur in these cases from pneumonia, pleurisy, and pericarditis, particularly if the muscles of deglutition and respiration become affected. Death may occur from general asthenia, but on the other hand there may be recovery at any stage (6).

The only significant laboratory findings are creatinuria and a positive creatine tolerance test. These are dependent on the fact that there is a diminished ability of the anatomically changed and diseased muscles to store creatine. Pathologically, perivascular and diffuse infiltrations of lymphocytes and plasma cells become and remain to the end an outstanding feature in cutaneous, subcutaneous, and especially in muscular tissues. The muscles become edematous, and may change in color, becoming gray, yellow, or speckled. In some areas the striations become faint or entirely disappear (6).

SUMMARY

In comparing our case with those reported previously we have found that this man presents the typical picture of scleredema aside from the extraordinary duration of the process. The onset was characteristic, occurring after an episode of scarlet fever, and the subsequent course has been exceedingly benign in contrast with the changes that would be expected in scleredema of 8 years' duration.

It is noteworthy that this man was accepted for military service and that the activities of military life and of a fairly active civil life have not at all been impeded by his skin condition.

In view of the excellent prognosis and the lack of any disabling or even restricting symptoms or signs of the disease we have felt that the patient could be returned to his home and to his normal activities without further symptomatic treatment.

There is still no explanation of his presenting symptom of fatigue, nor of the high values for blood cholesterol; there is no evidence, however, that either of these factors is associated with his skin disease.

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Malignant Neoplasms at Autopsy

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THE PURPOSE of this study is to consider the incidence of neoplastic disease in autopsy material from a naval hospital during the 7-year period from 1941 to 1947. No other reports on this subject are available. Statistical surveys are often very illuminating only after a significant number of cases have been compiled. Although these records provide accurate data as to causes of death in naval personnel when figures are compared to other hospitals, due consideration must be given to the peculiarity of the population in each instance.

We were impressed by the high incidence of malignancies in post mortem examinations and the unusual predominance of certain tumors. It was decided therefore, to compare these statistics with those of other institutions. We chose for comparison several large general hospitals, one from the North Temperate Zone, another from the

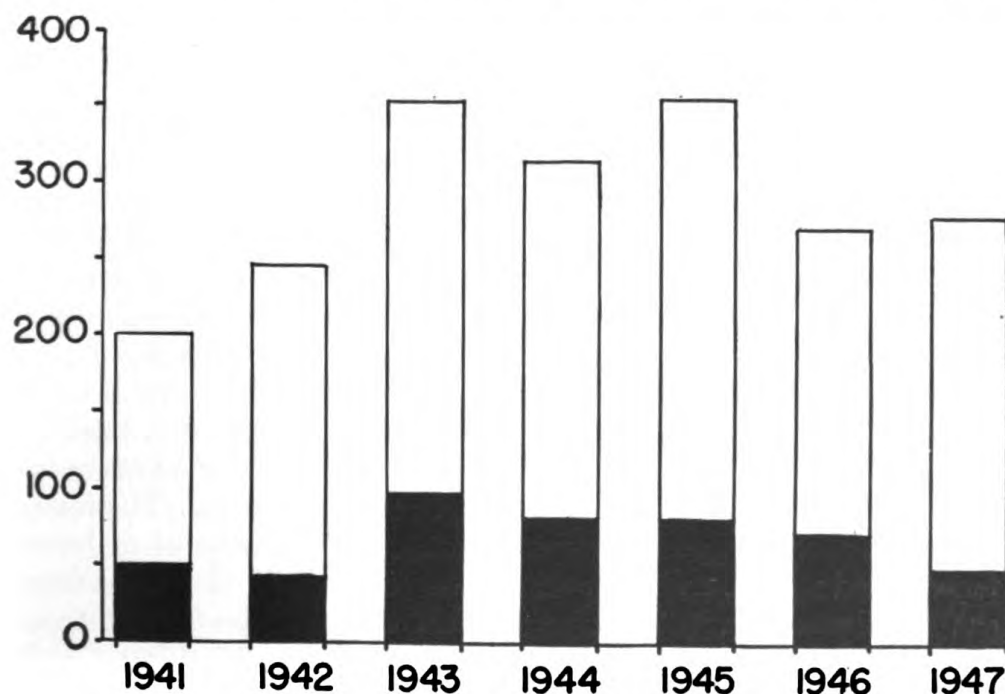


Figure 1.—Ratio of tumors to autopsies.

South Temperate Zone, a third located in the Tropics, and a Veterans' Administration hospital whose population was almost identical to ours in sex and race. A comparative analysis and an evaluation was made with reference to the general incidence of malignant tumors in post mortem examinations, the age distribution of these tumors, the percentage occurrence of neoplasms in each regional group, and the unusual predominance of certain tumors in various institutions.

General incidence.—During 7 years from 1941 to 1947, 2,001 autopsies were done at the Philadelphia Naval Hospital by the residents and members of the staff. Four hundred and eighty-six, or 23.4 percent, died from neoplastic disease or had evidence of malignant growths. (One autopsy performed on a female who had cancer of the uterus is not included so that our population is 100 percent male.) This proportional yearly relationship is illustrated graphically (fig. 1).

TABLE 1.—Incidence of malignant tumors in autopsy cases from 1941 to 1947

Year	Admissions	Deaths	Autopsies	Tumors	Incidence
					<i>Percent</i>
1941.....	9,167	442	200	50	25
1942.....	12,058	491	243	43	17
1943.....	14,467	455	352	98	27
1944.....	19,910	726	313	80	25
1945.....	26,058	632	351	80	23
1946.....	22,050	493	268	69	27
1947.....	12,477	451	274	66	23
Total.....			2,001	486	23.4

Lund (1) analyzed 26,700 protocols from the years 1867 to 1933 of autopsies performed at the Philadelphia General Hospital. In his survey the incidence of tumors doubled in this era but the increment did not apply to all tumors. The main rise was in neoplasms of the uterus, skin, oral cavity, prostate, lung, bronchi, larynx, trachea, and urinary bladder. A comparative survey of all the hospitals is shown in table 2. In an analysis of autopsies performed at a Veterans' Administration hospital, Nolan (2) reported 180 malignant tumors in 1,250 cases or an incidence of 14 percent. The series is the most comparable to ours in view of the fact that 99.7 percent of the population were males, 87 percent of whom were white. Another survey of 5,000 cases by Cleland (3) from Australia revealed 817 or 16 percent malignancies from 1920 to 1943. Brines (4) reported a series of 1,535 autopsies in which 127 or only 8 percent died of malignancies. The latter report was from a general hospital with the usual ratio of males to females and a racial incidence of 3 whites to 1 Negro. From the Gorgas Hospital, Kean (5) analyzed 14,304 autopsies performed from 1904 to 1944 in which 635 had neoplastic disease resulting in an inci-

dence of 4 percent. Thorsness (6) cited 39 tumors in 1,000 autopsies (table 2). A comparative survey of all the hospitals is shown.

TABLE 2.—*General hospital survey*

Author	Hospital	Autop-sies	Tumors		Gastro-intestinal		Lung		Liver	
			Num-ber	Per-cent	Num-ber	Per-cent	Num-ber	Per-cent	Num-ber	Per-cent
Nolan	Veterans' Administration, 99 percent male	1,250	180	14	51	28	11	6	2	1
Cleland	South Temperate, general	5,000	817	16	291	35	55	6		
Brines	Temperate, general	1,535	127	8	42	34	11	8	5	3
Kean	Tropical, general	14,304	635	4	219	34	36	5	55	8.6
Thorsness	Temperate, general	1,000	39	3.9			6	15		
Siegler	Temperate, military	2,001	486	23.4	130	26	106	22	20	3

Age Incidence.—Our data was further analyzed to determine the age distribution of these tumors (table 3) and the totals of each age group were combined for a 7-year period. It is interesting to note a slight, questionably significant fall in the 30–39 age group which may be explained by the fact that these individuals were too young for cancer and too old for lymphomas. The oft-quoted trends are confirmed by this analysis in that the greatest number of tumors occurred in the older ages. Of further interest is that 37 percent of malignant neoplasms occurred before the age of 50 years. It would seem also from these statistics that an individual who reaches the age of 70 years can be fairly certain that he will not die of cancer. Only 7 percent of the tumors occurred after that age.

Table 3.—*Age incidence of malignancies*

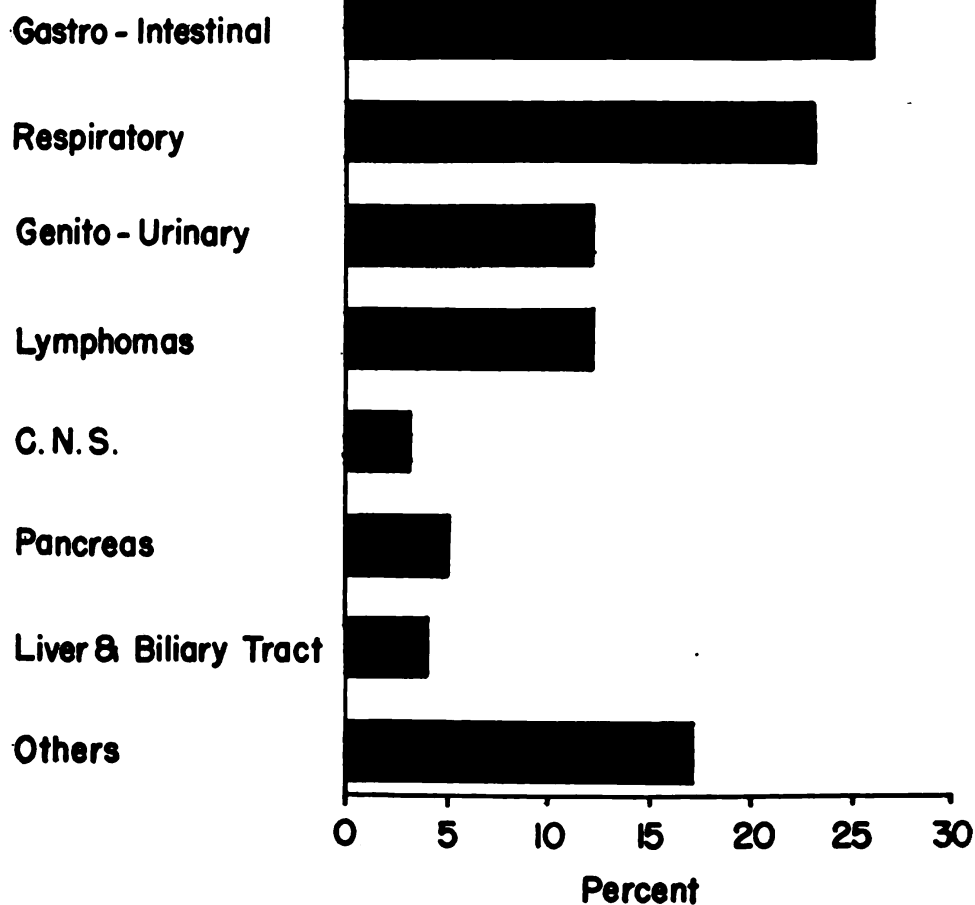
Ages	1941	1942	1943	1944	1945	1946	1947	Totals	Percent
18 to 29			3	7	14	9	6	39	6
30 to 39	1		5	8	5	5	4	28	6
40 to 49	17	11	23	24	12	11	6	104	23
50 to 59	18	21	42	23	26	30	34	194	39
60 to 69	10	9	20	16	13	7	10	85	17
70 to 79	3	2	4	2	7	7	4	29	6
80 to 89	1		1		3		2	7	1

Anatomical incidence.—The occurrence of neoplasms was calculated according to systemic involvement (table 4 and fig. 2). Cancer of the lung was far more prevalent than had been expected. Lund (1) placed special emphasis on lung tumors and found an increase from 0.02 to 0.58 percent in his series. It rose from twenty-third position to sixth in relation of incidence to other tumors. The cause of this phenomenon was ascribed to the changing attitude of the pathologist toward this disease entity and to increased microscopic investigation. New labora-

tories, radium, diagnostic x-ray, and an actual increase per se are other factors. In the Veterans' Administration hospital series there were only 11 malignancies of bronchogenic origin. In all other reports reviewed (1) (2) (3) (4) (5) (6) we could not find the predominance as noted in our series. The explanation for the high percentage could not be adequately ascertained. Lung tumors comprised about 98 percent of the respiratory malignancies and were almost equal in incidence to all the gastro-intestinal tumors combined.

TABLE 4.—*Anatomical incidence of tumors*

System	1941	1942	1943	1944	1945	1946	1947	Total	Percent
Respiratory	8	9	16	12	23	17	11	106	23
Gastro-intestinal	12	14	31	20	23	18	17	130	28
Genito-urinary	6	8	9	11	9	6	8	57	11
Lymphoma	6	1	12	16	7	12	5	59	11
Central nervous system	4		3	1	3	6		17	3
Pancreas	4	2	4	4	2	7	1	24	5
Liver and biliary	3	1	3	4	1	3	5	20	4
All others									17

Figure 2.—*Anatomical incidence of tumors.*

Primary hepatic neoplasms were relatively infrequent in most surveys. At Memorial Hospital (7) it was found that 1.17 percent of all admissions were liver tumors. In our series 3.0 percent of all tumors found at autopsy were malignancies of the liver. The significance of geographical location upon the incidence of tumors is augmented by the data from the Gorgas Hospital where 55 hepatic new growths were found in 635 post-mortem examinations for an incidence of 8.6 percent.

English (8) analyzed 16,667 cases of neoplasm distributed among the various organs of the genito-urinary tract and failed to find one instance of urethral carcinoma. In our series one case was observed.

CONCLUSIONS

During a 7-year period 2,001 autopsies were performed at the Philadelphia Naval Hospital and of these 486 were on those who died from or had evidence of neoplastic disease, resulting in an incidence of 23.4 percent. This rate was compared with other institutions of similar and different populations and was found to be significantly higher. One is made more cognizant of the high incidence of tumors in the younger age groups by the fact that in our analysis 37 percent of malignancies occurred before the age of 50 years. A systemic analysis revealed a large series of lung malignancies which were almost equal to all the gastro-intestinal tumors combined and more abundant than in any other hospital. The incidence of hepatic tumors was increased and the usual ratio of hepatomas to cholangiomas was reversed. There were 10 hepatomas and 5 cholangiomas. In view of the survey by English, 1 case of carcinoma of the urethra is in itself significant.

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Primary Carcinoma of the Liver (Hepatoma)

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THE incidence of primary carcinoma of the liver is low in the white race, comprising from 0.2 to 0.5 percent of autopsies performed on all types of cancers (1). Hepatoma occurs most frequently in males between 40 and 60 years of age (2), corresponding to the age of cirrhosis—about 50 years of age (3), whereas biliary carcinoma rarely occurs before 40 years and is more common in the female sex (1).

It is well established that cirrhosis is a chief predisposing factor in the production of hepatoma. Neoplastic change probably follows the hyperplasia and regeneration of the hepatic cells in multicentric foci.

The preexisting cirrhotic liver may be due to any one of the numerous diseases and chemical agents which have been known to produce cirrhosis: Chronic biliary disease and biliary obstruction; amebiasis; intrahepatic lithiasis; helminthic infestations; syphilis; and various ingested toxins including alcohol (4). There is a racial susceptibility to hepatoma as is proved in the Bantu races of South Africa who consume alcoholic beverages from early childhood and who have a high rate of hepatic malignancy (5). Analyzing malignant disease in natives of South Africa, Vint (6) reported that 13 percent of epithelial tumors were primary hepatic carcinomata, being more common than carcinoma of all other organs, including the stomach.

It must be remembered that hepatoma is not necessarily a disease of adults but that young children are also subject to it (7). Twenty-five percent of the cases of hepatoma reported in the literature were in persons less than 20 years of age. Griffith collected 57 cases in individuals less than 16 years of age (8).

CASE REPORT

H. B. F., a 59-year-old male, entered the hospital on 19 November 1946 because he was vomiting blood. Five years earlier he had been in the hospital for 2 months because of a gastric hemorrhage. His lowest red blood cell count, as reported at that time, was 3,750,000 and a notation was made that pedal edema was present, which failed to respond to digitalization.

The patient stated he had been vomiting blood for 24 hours, but previously had felt well except for "gas pains" and intolerance to fatty food. A history of intermittent jaundice since 1915 was obtained. He lost 25 pounds of weight in 6 weeks prior to present admission and had developed varicosities of his lower extremities, with a slow healing post-traumatic varicose ulcer of his left ankle. The patient complained of an aching pain in his right hip which began 1 week prior to his present admission.

Physical examination.—The patient appeared feeble and chronically ill with extreme pallor of the skin, conjunctivae, and mucous membranes. The lung fields were clear to clinical examination. The heart was enlarged to the left and a systolic murmur heard loudest at the apex was present. The blood pressure was 102/56. The abdomen was obese, however the liver edge could be palpated 2 cm. below the right costal margin. Numerous small telangiectasia were noted over the abdomen and the chest. The neurologic examination was negative.

Laboratory study.—Red blood cells, 2,670,000; white blood cells, 11,500 (66 segmenters, 8 banks, 3 juveniles, 20 lymphocytes, 3 monocytes); urinalysis specific gravity 1016, with a negative chemical and microscopic examination; blood urea nitrogen 14.8 mg. percent; blood Kahn test negative.

During his hospital stay he received repeated blood transfusions, but he continued to vomit blood for several weeks. He developed what was considered to be bronchopneumonia and was critically ill, but responded well to penicillin and blood transfusions. A chest roentgenogram at this time revealed a soft, diffuse mottling throughout both lung fields (fig. 1). A gastro-intestinal series at 6 weeks was considered to be negative, however the radiologist did consider the possibility of an ulcer crater on the greater curvature of the stomach, but was not certain of it.

The patient gained strength and showed definite improvement until February 1947, when he began complaining of severe pain in his right hip. Roentgenograms showed no bony abnormalities in the hip joint or pelvis and physiotherapy failed to give him any relief from the pain.

In March he began to decline with loss of weight, anorexia, and extreme irritability, complaining bitterly of the pain in his right gluteal region. Clinically, he began to show a slight icteric tinge of the skin and sclera. His icteric index was 14.

By April 1947, he had lost so much strength that he was confined to bed and at this time a repeat roentgenographic study of the pelvis did not show any evidence of pathologic bone changes. A hard tumor mass appeared rather suddenly in the right gluteal region on 20 April 1947. When a specimen for needle biopsy was taken from this mass, a great deal of yellow, blood-tinged, cellular material welled up, giving the patient slight, temporary relief from pain. From this biopsy a diagnosis of metastatic renal cell carcinoma was made. Intravenous and retrograde pyelograms were negative, but at this time a pathologic fracture of the right ileum was noted.



Figure 1.—A soft, diffuse mottling throughout both lung fields, with bony involvement of the third right rib.

The patient failed rapidly, showing extreme weakness and increasing jaundice. On 10 May 1947 he began vomiting great quantities of bright red blood clots, and died in spite of repeated blood transfusions.

Autopsy findings.—When an incision was made into the peritoneal cavity, a strikingly huge, lobulated liver was seen parallel to an extremely distended stomach. The liver weighed 3,750 grams and the surface was studded with shiny, protuberant nodules of a putty consistency, measuring up to 3 cm. in diameter. Even though cut section revealed the liver substance to be nearly completely replaced by these greenish-tan putty nodules, it cut with firm resistance. The gall-bladder was distended, however the biliary passages were patent throughout. The stomach was distended with dark bloody fluid and numerous varicosities were noted at the cardiac end of the esophagus. An indurated scar, measuring 3 cm. in diameter, was present on the greater curvature in the prepyloric region. The rest of the gastro-intestinal tract was negative. The genito-urinary tract was negative throughout. The pleural surfaces of the lungs were studded with a multitude of grayish-green opalescent nodules varying in size up to 0.5 cm. in diameter, and on cut section through the lungs the nodules were found to be evenly dispersed throughout the parenchyma. Two metastatic implants of

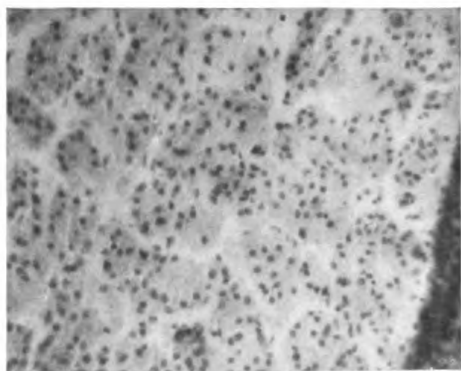


Figure 2.—High power photomicrograph of metastatic implant in the myocardium which shows numerous mitotic figures.

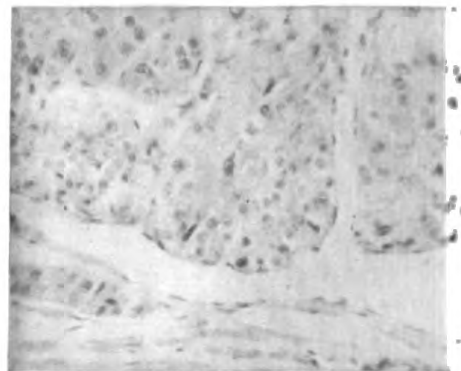


Figure 3.—Low power photomicrograph of the liver illustrates attempts at formation of cords of hepatic cells.

tumor were found in the myocardium of the right ventricle just beneath the tricuspid valve (fig. 2). A bony metastasis was present in the third rib posteriorly and there was destruction of the wing of the right ileum with extension into the psoas and gluteal muscles.

Microscopic study of the tissues showed a marked ability of the tumor cells to reproduce cords of hepatic cells (fig. 3). Function of some of the tumor cells was evidenced by the presence of bile pigments in the cytoplasm. Sections of the liver demonstrated an extreme degree of cirrhosis.

COMMENT

1. This case is presented as a primary carcinoma of the liver (hepatoma) with metastasis to the lungs, myocardium, bone, and muscle.
2. It is very seldom that a correct diagnosis of hepatoma is made ante mortem, however the diagnosis usually can be made from the

autopsy tissues. In this case formalin fixation of the autopsy tissues caused an oxidation of the bilirubin to biliverdin, thus giving the tumor tissue a brilliant emerald-green color.

3. It is of interest to note how late in the disease in this case evidence of liver damage appeared, and how completely the normal liver parenchyma was replaced by tumor tissue.

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Craniopharyngioma

Report of a Case

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A CRANIOPHARYNGIOMA may produce a number of varied signs and symptoms. Various combinations of these will be sufficient evidence upon which a positive diagnosis of the presence of this type of brain tumor may be made. This case is of interest because the patient presented the minimum of signs and symptoms necessary to establish the existence of such a tumor and to accurately localize it. Because this is a comparatively rare brain tumor, a partial review of the literature and the developmental embryology is included.

Clinicians became interested in the tumor now called craniopharyngioma when reports appeared in the literature of tumors in the region of the hypophysis cerebri which caused no symptoms of acromegaly. (The syndrome of pituitary tumor and acromegaly previously had been described by Marie). Babinski, Mott, and Frölich had reported cystic epithelial tumors in this region prior to 1899; and in 1904 Erdheim completed an exhaustive study which established the essential characteristics of this type of intracranial neoplasm (1). There are many synonyms for the name craniopharyngioma: Rathke's pouch tumors; suprasellar cysts; hypophysial duct tumors; epitheliomas; and others. Most of the terms are unwieldy; some are inexact. It is now conceded that they are epitheliomas that arise from squamous epithelial cell rests of the craniopharyngeal duct and they are referred to as craniopharyngiomas.

CASE REPORT

A 29-year-old woman who had been suffering from recurrent frontal headaches for 2 years was admitted to the hospital in March 1946. These headaches were becoming increasingly severe and were accompanied by "black spots" before the eyes. One month prior to admission the patient noticed a slight dimness of vision.

Physical examination was negative. Both pupils reacted normally to light and accommodation. The left fundus was somewhat pale, but there was no definite papilledema. The rest of the neurological examination was negative. The skull films were normal. The visual fields for black and white were normal.

The visual fields for color, i. e. red, showed a marked bitemporal hemianopia. Upon these findings a diagnosis of suprasellar tumor was made and an operation was performed.

A frontal flap was turned under local anesthesia and after retraction of the right frontal lobe the right optic nerve was visualized. An encapsulated gray-domed tumor about the size of a marble bulged medially to the nerve. The tumor was cystic and 7 cc. of creamy fluid were aspirated from it. No cholesterol crystals were seen on the surface of this fluid. The capsule was then opened and found to be empty. The dome was removed and it was observed that there was no tissue within the cavity. Fibrin foam was placed in the cavity to assure hemostasis and the wound was closed in anatomical layers. The immediate post-operative condition of the patient was satisfactory.

Microscopic examination of the removed tissue proved the tumor to be a craniopharyngioma.

On the second post-operative day the patient developed polyuria and polydipsia. These symptoms persisted for 5 days and were ultimately controlled by the intramuscular administration of $\frac{1}{2}$ ampule of pitressin twice a day and later by a nasal spray of pituitrin. The patient's headaches and visual symptoms were completely relieved.

DISCUSSION

The persistent, recurrent, frontal headaches, and visual disturbances complained of by the patient made one suspect the presence of an intracranial neoplasm. However this diagnosis was presumptive, and it was not until the visual fields were charted and the bitemporal hemianopia demonstrated that the diagnosis of suprasellar tumor was established. In this case the presence of a marked bitemporal hemianopia served to accurately localize the tumor and also aided in establishing the presumptive diagnosis of intracranial neoplasm.

Color vision, especially that for red, is often the first visual function to be lost when a pathologic condition involves the optic tracts or the retinae. By testing the visual fields for color, the diagnosis in this case was established much earlier than would have been possible by any other means, inasmuch as the patient presented so few symptoms referable to a craniopharyngioma.

The age of a patient with a suprasellar tumor is significant. This patient was in an age group where a pituitary adenoma would have been expected. Craniopharyngioma is primarily a tumor of childhood, although it may occur in all age groups. The greatest incidence is in patients near 15 years of age (1) (fig. 1).

When the region of the hypophyseal stalk in a number of normal individuals is examined, small masses of squamous epithelial cells will be found in the infundibulum, especially along the anterior border of the stalk at its superior and inferior ends. These cells resemble the basal cells of the epidermis and this gives the clue to the origin of the craniopharyngioma. In the embryo the pituitary gland arises from two primordia, the stomodeum and the diencephalon. An out-

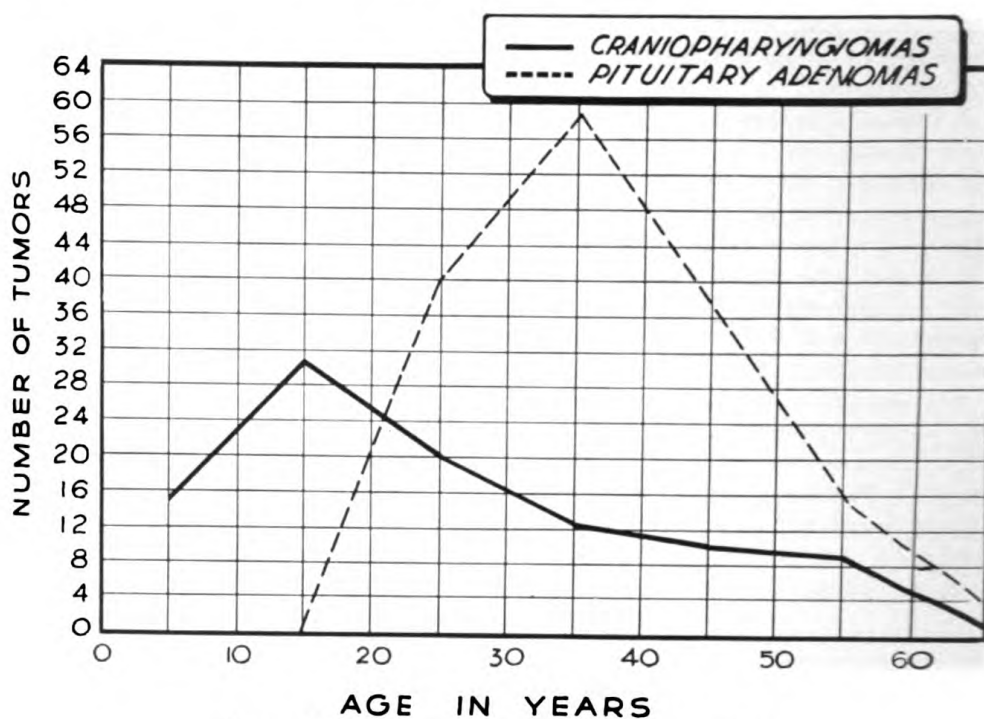


Figure 1.—Age incidence of suprasellar tumors.

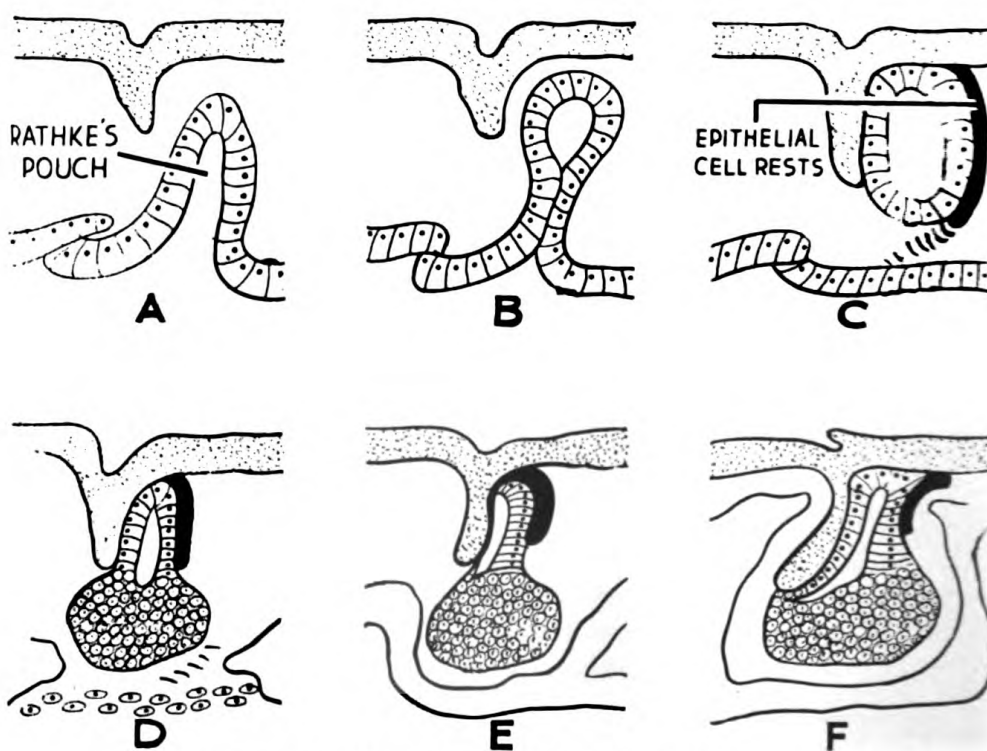


Figure 2.—Embryological development of the pituitary gland.

pocketing arises in the buccal mucosa anterior to the oral plate and forms what is known as Rathke's pouch. It extends upward and backward to contact a diencephalic downgrowth around which it partially wraps itself. In the third month of embryonic life the connection of Rathke's pouch with the buccal cavity disappears. The developing sphenoidal bone completes this separation. The epithelium from Rathke's pouch parallels that of the stomodeum in its further development progressing through the cuboidal, transitional, and finally squamous stage. After the tenth week of embryonic life there occurs in the ventral part of the pouch a tremendous proliferation of cells (formation of the anterior lobe of the pituitary) so that the original anterior wall of the pouch (in which are imbedded the epithelial cell rests) comes to lie superior to the anterior lobe, and finally is pushed into the region of the stalk (1). It is from these squamous epithelial cell rests that the craniopharyngiomas arise (fig. 2).

Small cystic epithelial cell rests and tumors are occasionally seen within the sella turcica (intraseellar cysts), the posterior wall of the nasopharynx in adults (5), and have even been shown embryologically within the sphenoid bone (4) (5). A craniopharyngioma arising from epithelial cell rests that were evidently located within the floor of the third ventricle itself resulted in a case presenting unique roentgenological and neurosurgical features (4). The patient presented clinical evidence of increased intracranial pressure, and the skull film showed evidence of suprasellar calcification. An exploratory craniotomy revealed no tumor or other pathologic condition in the region of the infundibulum. The external surface of the floor of the third ventricle was normal. Ventriculography showed a filling defect (tumor) in the third ventricle. A second craniotomy revealed a craniopharyngioma entirely within the third ventricle. The tumor was removed through the foramen of Monroe, and the microscopic examination revealed no histological evidence of tissue from the floor of the ventricle in the tumor, indicating it to be a growth arising primarily within the third ventricle (4).

Bailey (1) states that the complaints of patients with craniopharyngiomas vary according to their ages. Children have headaches, vomiting, and very often have choked disks. Older patients first complain of failing vision and headache, but rarely have choked disks. Young adults may notice first a failing libido, amenorrhea, or obesity. In general, children have a much higher incidence of increased intracranial tension. However, a certain complex of symptoms and signs runs through the entire group with certain symptoms or signs being most prominent at different ages.

The symptoms coincident with the growth of a craniopharyngioma arise from three sources: (a) Increased intracranial pressure; (b) dis-

turbance of function of the hypophysis; and (c) compression of neighboring nervous structures.

A tumor in the region of the third ventricle is very likely to interfere with the circulation of the cerebrospinal fluid and the resultant symptoms and signs of headache, vomiting, swelling of the optic disks, slowing of the pulse, and, in very young children, hydrocephalus are likely to appear. It is difficult to understand, however, why these symptoms often do not occur in adults in whom the tumor usually reaches a size equal to those of children (1).

Disturbances of hypophysial function will, in children, result in a stunting of growth, producing the thin, fragile Lorain type of individual, or the fat, sleek Frölich type, either of which may or may not be associated with a polyuria following disturbance to the posterior pituitary or the hypothalamic area. In adults an infantile habitus, sparse body hair, disturbance of sexual function, wrinkling of the skin, and lowering of the metabolism with associated lassitude and fatigue, all give evidence of a dyspituitarism.

Compression of the adjacent optic chiasm results in the characteristic visual symptoms associated with a craniopharyngioma and may also produce an optic atrophy. Large temporal scotomas are common findings and the visual fields may show a more or less complete bitemporal hemianopia. Homonymous defects are rare. Diplopia due to compression of the sixth cranial nerve is seen occasionally (1).

Occasionally a craniopharyngioma will push upward through the floor of the third ventricle, destroy the nuclei and tracts of the hypothalamic region, and cause symptoms of vegetative disturbance such as hypersomnia, hyperthermia, or hypothermia, cardiac irregularities, or emotional disorders (1).

Roentgenograms of the skull which show suprasellar or intrasellar calcification are a great aid in the diagnosis of craniopharyngioma. According to Cushing (2), 80 percent of patients having these tumors show detectable shadows of flaky calcification in this area. Often the sella turcica can be seen to be widened and flattened and the clinoid processes eroded. A pituitary adenoma usually produces a symmetrical enlargement of the sella turcica (1) (2).

Differential diagnosis must be made almost entirely from pituitary adenomas. Adenomas, however, almost invariably develop after the age of 15, 15 being the optimum age for the development of craniopharyngiomas. Clinically an adenoma is rarely accompanied by polyuria nor, usually, by stunting of the growth, but may produce the diagnostic symptoms of acromegaly (2). Visual fields in cases of adenoma are usually regular in defect whereas bizarre visual field defects and scotomas tend to be more common in cases of craniopharyngioma (3). Differentiation of these tumors from meningioma

arising from the tuberculum sellae, glioma of the optic chiasm, and very rarely, from cerebellar tumors in children must be kept in mind (1).

In lieu of a conclusion, a summary of a report of 14 cases of verified craniopharyngiomas from the surgical service of the Mount Sinai Hospital, New York, is presented here (3). In this series of cases it was found once again that this tumor is more common in the younger age groups. No correlation was shown, however, between occurrence of the tumor and the sex of the patient. Trauma preceding the occurrence of a craniopharyngioma (occurring in 3 cases of this series) must be concluded to be purely coincidental and to have no active part in stimulating the occurrence or growth of these tumors.

The most frequent early symptoms manifested by the patients in the series were dimness of vision, headaches, and scotomas, although many of the other symptoms and signs reviewed earlier in this article also were seen in cases of longer standing. The type of visual field defect in these patients consisted of temporal scotomas in all but one case in which the patient had a bitemporal hemianopia.

Suprasellar calcification was evident on the skull films of 7 of the 14 cases.

Eleven of the tumors in the series were cystic, only three being solid in nature. The types of tissue found in the tumors, especially the solid ones, included masses of cells identified microscopically as cartilage, bone (calcification), hair follicles, and sebaceous cells in addition to the squamous and cuboidal epithelial cells which form the groundwork of all craniopharyngiomas.

In three patients in the series the tumor pushed the floor of the third ventricle upward as it grew and was found protruding into the third ventricle at surgery.

In only two of the cases the pituitary gland was found to be compressed and to show signs of partial degeneration (3). Two other cases, however, showed no evidence whatever of a pituitary gland, a yellow cheesy material having entirely replaced the pituitary tissue.

The symptoms presented by these 14 patients are divided into 4 groups: (a) Vegetative disturbances; (b) intracranial hypertension (nausea, vomiting, papilledema); (c) pressure by the tumor on surrounding structures (optic atrophy, dimming of vision, scotomas, hemianopic defects, and occasional pyramidal or cerebellar signs); and (d) roentgenographic evidence of suprasellar calcification (3).

Treatment of a patient with a craniopharyngioma is entirely surgical. These tumors do not respond to high voltage roentgen therapy (1). The typical craniopharyngioma lies in an inaccessible location in the center of the brain. It is guarded in front by the optic nerves, in back by the brain stem, flanked on the sides by the carotid

arteries, and surrounded by the *circulus arteriosus*. Since these tumors are attached and receive their blood supply at the base and are usually cystic, especially in the upper part, they are amenable to surgery (1). If the cysts are merely aspirated they refill; if an attempt is made to remove all of the cyst wall from this vital region of the brain, the mortality rate approximates 100 percent (2). Surgical treatment at present consists of aspiration of such cystic tumors followed by the removal of the dome of the cyst. Prognosis following this treatment may be judged from the results obtained in the series of 14 cases previously summarized. All of these were treated surgically. There were 6 post-operative deaths and the longest survival period, before recurrence of symptoms, was 9 years (in a child) (3). In spite of the benign and favorable appearance of these tumors to the surgeon, "until some method is devised whereby the usually multilocular epithelial lesion can be destroyed *in situ*, the mortality will doubtless remain high" (2).

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Urachal Cysts and Sinuses

Discussion and Report of a Case

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FOR AN intelligent discussion of this subject, a brief review of the embryology of the umbilical cord and the allantois is in order.

The body stalk, which later becomes the umbilical cord, connects the embryonic disc with the trophoblast. This in turn becomes the chorion. The inner cell mass, which is to become the embryo, is at first attached directly to the trophoblast. After the development of the amnion on one side of the embryonic disk, and the yolk-sac on the other side, they become surrounded by the chorionic mesoderm which anchors the embryo to the inner wall of the chorion. As the embryo and the chorion increase in size, this attachment becomes relatively reduced. Its attachment to the embryo gradually becomes ventral and is known as the umbilical cord (1).

The umbilical cord contains the following structures: (a) the umbilical vein; (b) two umbilical arteries; (c) the allantois; (d) the Vitello-intestinal duct; and (e) omphalomesenteric vessels.

The allantois arises as a tubular diverticulum of the posterior part of the yolk-sac and grows into the body stalk; when the hindgut is developed, the allantois is carried backward with it and then opens into the cloaca which is the terminal portion of the hindgut. The diverticulum is lined by entoderm and is covered by the mesoderm of the body stalk.

The urinary bladder is formed, partly from the entodermal cloaca and partly from the ends of the Wolffian ducts. The allantois takes no share in its formation and further detailed development of the urinary bladder will be omitted, except to state that the apex of the urinary bladder is prolonged to the umbilicus as a narrow canal; this is later obliterated and becomes the median umbilical ligament. The intra-abdominal portion of the allantois between the umbilicus and the urinary bladder is known as the urachus.

Under normal conditions the Vitello-intestinal duct, omphalomesenteric vessels, umbilical vessels, and urachus atrophy into fibrous cords. In consequence of this process, the umbilical ring, which is traversed

by these structures, is reduced to a small orifice. After birth, the force of the retraction of the umbilical vessels and the urachus draw the scar against the circumference of the umbilical ring. The adhesion formed by the umbilical vein is less dense than that resulting from the adhesion of the scar to the inferior contour of the ring. This latter is caused by the inferior pull of the two obliterated umbilical arteries and the urachus. Thus it occurs that in the superior part of the ring there is an area of lesser fusion where the subcutaneous tissue is almost in contact with the extraperitoneal fat. The development of umbilical hernias is most likely to occur in this area. In the adult the umbilicus is retracted because the urachus and the obliterated umbilical arteries form unyielding cords which are incapable of elongating as the abdominal wall and pelvis grow (2).

Surgical conditions of the umbilicus, due to the persistence of embryological structures, although rare, will be discussed.

The urachus may be patent, either in full or in part. When it remains fully patent there is a discharge of urine from the umbilicus. If it is partially patent a urachal cyst or sinus may form. According to Long (3) there are four types: (a) complete; (b) blind external; (c) blind internal; and (d) totally blind. Dudgeon (4), in 1940, stated that only about 154 cases of patent urachus were reported up to 1936 and that male cases exceeded female cases in a ratio of about 2 to 1. Vaughan (5) collected reports of 52 cases of patent urachus from the literature, 45 of which were completely patent and 7 were blind at either one end or the other. This anomaly is clinically significant only when it produces symptoms. As a rule symptoms are produced only in the presence of infection. It may be that a urachal patency may exist in the absence of urinary leakage at the umbilicus until back pressure arising from urinary obstruction, congenital or acquired, forces the urine through the minute channel. Canalization depends in part therefore, upon a congenital factor and in part upon an acquired factor. Occasionally symptoms arise from urachal calculi. Everett (6) described a case of peritonitis due to perforation of an infected urachal cyst. Other authorities have described tuberculous involvement of a patent urachus.

The treatment of a patent urachus is a radical excision of the fistulous tract. Repair of the bladder and abdominal walls is essential in the case of a large fistula. Insignificant ones may sometimes be induced to close through the application of cauterizing agents.

Other surgical conditions involving patency of the embryonal structures of the umbilical cord include the partial or complete persistence of the omphalo-(Vitello)-intestinal duct.

In early fetal life the midgut has a wide communication with the yolk-sac. As the abdominal walls approximate one another the

Vitello-intestinal duct becomes narrower and lies within the umbilical cord. Under normal conditions the intestine finally is set free from all connections with the yolk-sac and retires within the abdominal cavity, leaving no trace of its former connection with this structure. However, the Vitello-intestinal duct may fail to undergo complete obliteration and may persist into adult life.

The incompletely obliterated duct may be found with its proximal or intestinal end attached to some portion of the ileum near the ileocecal valve and its distal end free. This abnormality is known as Meckel's diverticulum. Occasionally the distal end of the diverticulum may be continued as a fibrous cord, connecting the intestine with the umbilicus. This may lead to intestinal obstruction at some later date (2).

The duct may remain open throughout its length and constitute one of the varieties of umbilical fistulae in which the escape of feces from the umbilicus may occur. Occasionally certain forms of cystic adenoma are found in the umbilical region which have arisen from vestiges of the omphalo-intestinal duct.

CASE REPORT

F. B. P., a 25-year-old white veteran, was admitted to the hospital on 20 August 1947, with a history of constant, nonradiating, periumbilical pain of 6 days' duration. The pain was associated with nausea which had developed 3 days before admission. This was his first episode of pain of this nature. He gave a history, typical of acute appendicitis in 1945, with symptoms of nausea, vomiting, and generalized abdominal pains which localized to the right lower quadrant in 48 hours; an appendectomy was performed at that time. No umbilical discharge of any nature was noted by the patient at any time. No history of urinary symptoms was obtained.

Physical examination: The patient was a young, well-developed and well-nourished white male in acute distress. Positive physical findings were confined to the abdomen. There was periumbilical tenderness associated with a moderate amount of abdominal rigidity in that area. No evidence of infection of the umbilicus, abdominal wall, or of the skin surrounding the umbilical area was found. On admission a flat plate of the abdomen revealed the presence of a large amount of gas in the large bowel and one loop of small intestine, lying to the left of the lower portion of the lumbar spine, was found to contain gas. No fluid levels were noted. At this time the question of possible early small bowel obstruction was considered. However, 12 hours after admission a repeat flat plate of the abdomen no longer showed evidence of gas in the small bowel. One observer palpated a small mass the size of an acorn in the midline just below the umbilicus.

Laboratory report: Admission urinalysis was normal. White blood cell count: 12,800, with 83 percent polymorphonuclears; 2 percent basophiles; 2 percent eosinophiles; and 13 percent lymphocytes. Red blood cell count 4,500,000, hemoglobin was 14.5 gm.

The periumbilical pain persisted for 2 days, associated with low-grade fever, but there was no further evidence of obstruction. Surgical exploration was performed on 25 August 1947 with a tentative diagnosis of urachal cyst.

Operation: Under spinal anesthesia, a right paramedian incision was made, extending from $\frac{1}{2}$ inch above the umbilicus to 2 inches below it. Upon separation of the tissues of the abdominal wall a sinus tract was found leading from the umbilicus and extending $1\frac{1}{2}$ inches caudad. This tract ended in a blind sac on the preperitoneal fascia layer. The incision was then extended across the midline, and the umbilicus and the urachal sinus were both excised. A yellowish, caseous material was expressed from the sinus tract as the latter was manipulated during the operation. The lateral umbilical ligaments which were attached to the inferior portion of the sinus tract were severed. These severed ligaments were sutured to the anterior rectus sheath. The peritoneum was incised and a small mass of omentum, 2 by 3 cm., was found attached to the peritoneum; this was freed. The peritoneum, linea alba, and the rectus sheath were closed with No. 32 wire (interrupted, vertical, mattress sutures). Skin and superficial fascia were closed with No. 36 wire (interrupted, vertical, mattress sutures).

SUMMARY

This patient had a urachal sinus of approximately $1\frac{1}{2}$ inches in length, and $\frac{1}{4}$ inch in diameter. Treatment consisted of radical excision of the umbilicus and of the urachal sinus. This extended from the umbilicus and ran along the preperitoneal fascia layer between the transverse fascia and the peritoneum itself. Microscopically the pathologic specimen was found to be lined with squamous epithelium.

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Prolapse of Male Genitalia in Frank Breech Presentation

A Case Report

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I. S., a white female, aged 22, para 0 gravida I, was admitted at 0830 on 12 May 1947 in active labor with pains of moderate intensity. Examination revealed a frank breech presentation.

On 14 May 1947 patient continued in active labor; extremely edematous male fetal genitalia protruded from the vaginal orifice.

Further examination at 2100 of the same day showed a high frank breech; the presenting buttocks were very edematous, and dusky, swollen male genitalia protruded from the vaginal orifice. The fetus seemed large and delivery by the vaginal route seemed impossible. Pelvic measurements: diagonal conjugata, 12 cm.; spines fairly prominent; sacrum, fair curve; transverse diameter, 8.5 cm.; and public arch 90°.

An attempt to push the breech up was unsuccessful. A low cervical Caesarean section was performed at 2330 on 14 May 1947, under pontocaine spinal anesthesia and a male, weight, 9 lb., 10 oz., was delivered with difficulty. The infant responded normally. His penis and scrotum were dark purple and enormously edematous and an irreducible phimosis was present. He had not voided by noon of the following day. Preputial adhesions were liberated and a dorsal slit was performed (fig. 1). Intermittent warm boric acid soaks were applied to the scrotum and penile edema subsided.

On 26 May 1947 (eleventh day) genitalia appeared to be normal, the dorsal slit had healed, and a circumcision was performed.

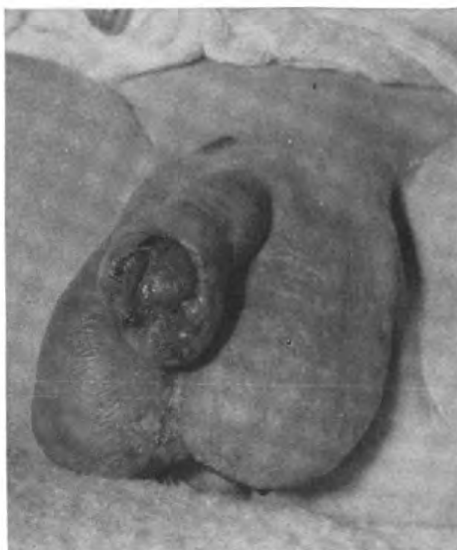


Figure 1.—*Appearance at age 15 hours immediately after dorsal slit.*



Angioid Streaks of the Retina

Case Report

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Angioid streaks of the retina although an unusual type of atrophy or degeneration of the retina presents a characteristic funduscopy picture with no clinical symptoms. This condition can readily be recognized in a routine ophthalmoscopic examination of the retina if it is kept in mind.

CASE REPORT

W. E., a 29-year-old colored male, was first seen at the United States Naval Hospital, Bethesda, Md., on 10 April 1947, complaining of the sensation of a lump in the throat. Examination at that time revealed a large ulcerated tumor on the posterior wall of the oropharynx. The patient was also found to have bilaterally enlarged, apparently chronically infected, tonsils and small yellowish-white patches on the buccal mucosa which had the appearance of Fox-Fordyce disease. A routine examination of the eyes revealed vision of 20/20 in each eye, normal external segments, and clear media. The ocular fundi revealed well developed angioid streaks bilaterally (figs. 1 and 2).

Biopsy of the tumor in the oropharynx proved it to be grade II epidermoid carcinoma. Surgery was performed removing the entire area in one block. Subsequent examinations have failed to reveal any evidence of a local recurrence or of regional lymph node invasion.

A specimen of the buccal mucosal lesions was taken for biopsy at a later date because of their resemblance to the rare mucosal lesions of pseudoxanthoma elasticum, and the diagnosis of Fox-Fordyce disease was established.

Reexamination of the ocular fundi in January 1948, when the patient returned to the hospital for follow-up examination and tonsillectomy, showed no apparent change in the appearance of the angioid streaks since the first examination. Physical examination failed to reveal any evidence of skin lesions typical of pseudoxanthoma elasticum. A complete series of roentgenograms of all bones was entirely negative for evidence of Paget's disease. The lesions of angioid streaks have been reported in Paget's disease, and for this reason it was felt that it should be eliminated as a possibility.

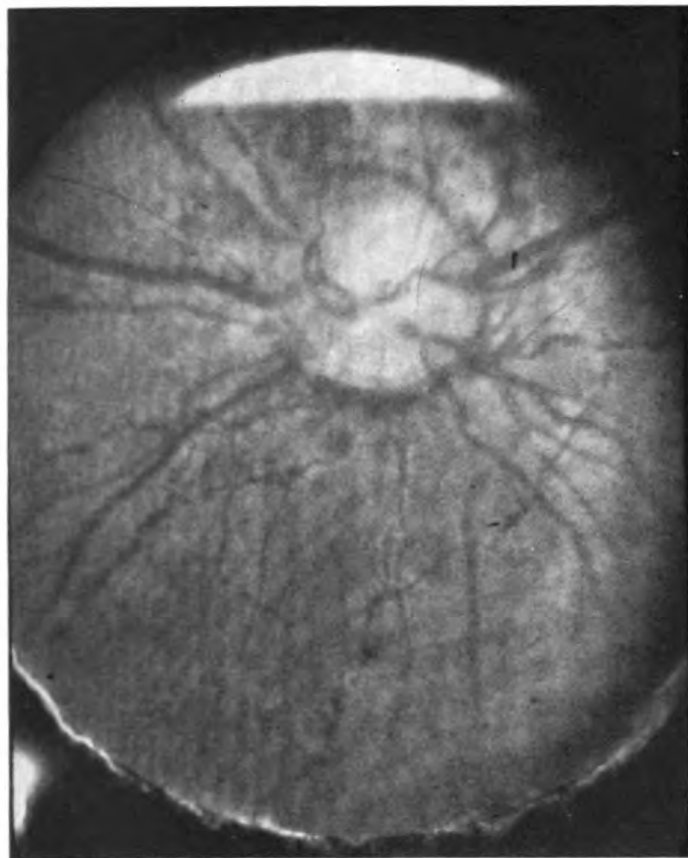


Figure 1.—Left eye.

Figures 1 and 2.—Fundus photographs of each eye in this case show the more or less typical distribution of the streaks coursing around the disk and also roughly parallel with retinal vessels.

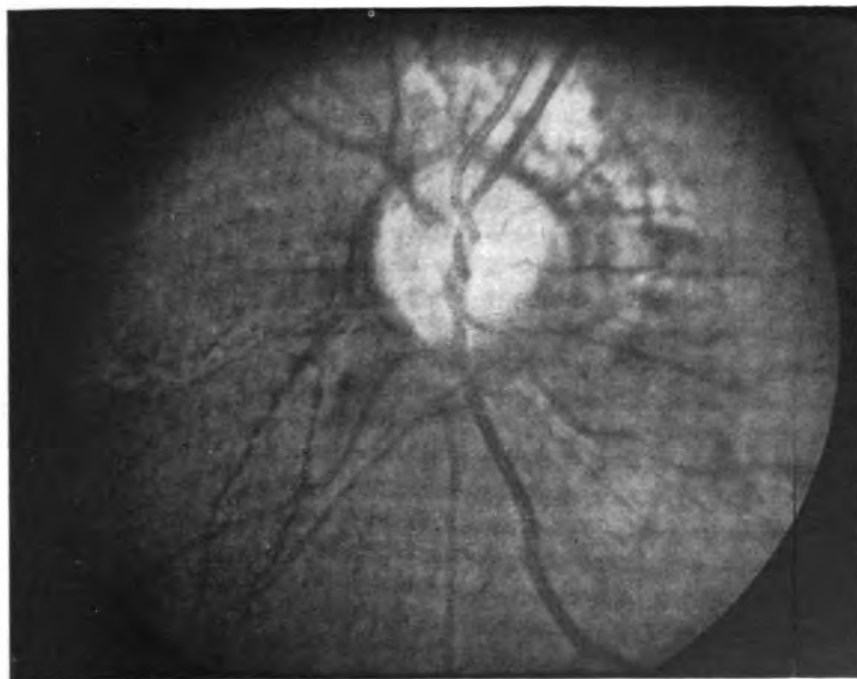


Figure 2.—Right eye.

Methanol and Formaldehyde in Normal Body Tissues and Fluids

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DURING the course of numerous toxicological analyses minute amounts of methanol and formaldehyde were consistently detected when using a refined method for these substances. Many cases had no history of ingestion of these substances and the primary cause of death was attributed definitely to other agents. The amounts of methanol found were very small when compared to known acute cases of methanol poisoning.

To determine if these substances were present in normal blood, 5 normal subjects including white and colored males and females were selected. Methanol and formaldehyde determinations were made on citrated whole blood, taken after fasting. Methanol was detected in all specimens and formaldehyde in 49 specimens. Methanol concentrations ranged from 25 to 245 micrograms percent and formaldehyde concentrations from 0 to 245 micrograms percent.

High vacuum distillation of fresh frozen plasma gave positive reactions for methanol and formaldehyde.

Five samples of urine, taken at random, contained methanol but were negative for formaldehyde. The methanol content was on the order of that given by von Fellenberg (1) who found 0.4 to 1.0 milligram per 750 grams.

There was no correlation between the methanol and formaldehyde content of blood, nor was the blood methanol or formaldehyde content related to race, age, sex, or weight. The suspicion that the source of methanol was dietary led to its detection in apples, oranges, celery, and carrots, but formaldehyde was not found in these foods. Tobacco and tobacco smoke have been reported as having a high methanol content (2) (3) but the series reported here did not differentiate between smokers and non-smokers.

The presence of these compounds in normal blood and in a dietary source poses the question of their possible effect on the body over a period of years. This problem of trace amounts of toxic organic and

inorganic chemicals probably deserves more consideration in medicine, especially in geriatrics. However, refined methods of toxicological analysis are required for their detection. The possible correlation of the formic acid content of blood with either of these two substances is being developed, not only to complete the oxidation cycle of methanol \rightarrow formaldehyde \rightarrow formic acid, but also from an ophthalmological standpoint.

The figures quoted here are from a series of 50 normal subjects, hence the determination of an exact "normal" figure, if there is one, must await further work. Evidently pectins liberate methoxy groups readily to liberate methanol. It is felt that the methanol detected was "free," rather than that it was an alcohol liberated by laboratory manipulation.

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Spontaneous Mediastinal Emphysema

Report of a Case

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SPONTANEOUS mediastinal emphysema, which usually occurs without demonstrable cause in young males in the third decade of life, results when air leaks from pulmonary alveoli into the interstitial tissues, flows between the pulmonary vessels and their sheaths, and into the hilus and mediastinum.

Pain in the chest is usually the first symptom and chief complaint. Its duration may be from a few moments to several weeks. Frequently very severe at the onset, its rather poorly defined location in the general precordial area and anterior thorax, together with an angina pectoris type of radiation (into neck, shoulder, and left arm) that is often present, may quite logically lead the coronary-conscious physician to suspect, initially, myocardial infarction. The pain is often aggravated by deep inspiration, by assuming the left lateral recumbent position, or by postural changes. Anxiety, perspiration, and even a sense of impending death are common in the beginning. Dyspnea, which is usually mild, of short duration, and unassociated with cyanosis, is noted in about 50 percent of cases. Crackling noises in the chest may be sensed by the patient.

Most constant and impressive among the physical signs is the loud and coarse crunching sound of mediastinal crepitation (Hamman's sign), which has been variously described as crackling, clicking, bubbling, snapping, roaring, squeaking, or rasping. It is heard loudest, as a rule, over the apex, precordium, and base of the heart, and seems to arise just beneath the bell of the stethoscope. Accentuation is ordinarily obtained by placing the patient in the left lateral recumbent position, sometimes by pressure with the stethoscope bell, and in our case by manual pressure over the apex while auscultating over the precordium. It is important to note intensity variations with postural changes. The duration of Hamman's sign varies from a few

hours to several weeks. Decreased cardiac dullness appears in about 33 percent of the cases. Subcutaneous emphysema, noted in the jugular or supraclavicular fossae, is of diagnostic value, but usually does not develop. Moderate left pneumothorax has been reported to occur in more than 50 percent of the cases. Respirations may or may not be slightly increased. A temperature higher than 99.6° F. is uncommon in the absence of complications or concurrent disease; occasionally it may range between 98.4° and 99.6° F. for a few hours or days. The blood pressure remains consistently within normal limits.

Leukocyte counts and erythrocyte sedimentation rates are customarily within normal limits, or occasionally slightly elevated. Although one case has been reported in which T-wave inversion appeared in the electrocardiogram, such tracings may be expected to show, at most, low voltage in lead 1 and/or slight changes in the electrical axis. In less than 50 percent of the cases the chest roentgenogram will disclose a narrow lucent band along the border(s) of the mediastinal shadow.

The prognosis is good in the absence of demonstrable pulmonary disease. Good results may be anticipated with a simple regime of symptomatic and expectant therapy.

CASE REPORT

A 21-year-old Hospital Corpsman was admitted, as a stretcher case, complaining of severe pain in the anterior chest and of difficulty in breathing. The onset was sudden, without warning or prodromata, and occurred while he was doing light work in the sick bay of his ship. He noted a severe, stabbing pain in the lower left posterior chest, which soon migrated to the precordium and anterior chest, up the left side and back of the neck, into the left shoulder, and into the left arm to elbow level. Simultaneously his respirations were almost "cut off"—not because of a sensation of compression or strangling, but because the pain was much intensified by respiratory movements. He began to sweat profusely, became pale, and required immediate assistance to prevent falling to the deck. A pearl of amyl nitrite was administered, and provided a measure of temporary relief, so that he could breathe with less discomfort. He reported that he felt restless during the attack. There was no nausea, vomiting, or feeling of gaseous distention. His past history was entirely noncontributory, as was the review by systems. Careful questioning led the patient to recall that about 9 months previously, on two occasions, he had experienced a momentary twinge of pleuritic pain in the left anterior thoracic base.

Physical examination: The patient was a well-nourished acutely ill young white male, hyposthenic in build, in considerable distress, but conscious, oriented, rational, and cooperative. The skin was pale, cool, and moist. Respirations were of short excursion and labored. The temperature was 98.6° F., pulse 78, respirations 20, and the blood pressure 150/70. The apex impulse of the heart was neither visible nor palpable. No thrills or shocks were felt. Cardiac dullness was obscured by a resonant precordium; however, neither enlargement nor displacement were suggested. The heart rate was normal and the rhythm regular. Auscultation revealed a most extraordinary, loud, crackling, roaring sound over the precordium and lower retrosternal area, loudest during systole, and seemingly accentuated by respiratory movements. The sound resembled most the

crinkling of cellophane, and impressed one as originating just beneath the chest wall. The quality of the cardiac sounds was almost completely obscured. No subcutaneous emphysema could be detected in the neck, supraclavicular fossae, or elsewhere. The remainder of the physical examination was essentially negative.

Morphine sulfate, grain $\frac{1}{4}$, and nembutal, grain $1\frac{1}{2}$, gave the patient subjective relief. He required no further medication during the course of his illness. He was kept in bed for 2 weeks.

Subjectively, the patient complained only of moderate precordial discomfort on deep inspiration or on certain postural changes; this gradually regressed and disappeared in 4 days. From time to time he admitted some slight soreness in the left shoulder and upper arm, and fleeting discomfort of an aching or sticking character in the back beneath the tip of the left scapula and in the region of the cardiac apex. Generally his progress was highly satisfactory, without apparent complication or sequela.

Objectively, the patient developed a low-grade, intermittent fever which never exceeded 99.2° F., and which lasted 4 days. The pulse remained slow and regular, and consistent with the temperature. There were no further respiratory disturbances. The blood pressure remained within normal limits, between 120 and 140 systolic, and 66 to 76 diastolic, and approximately equal in the left and right arms. There was a gradual decline from the level on admission (150 systolic) to a low of 118 systolic on the twelfth day. The lung fields remained free. The mediastinal crepitation varied in intensity from hour to hour and from day to day and was accentuated during systole, by respiratory movements, and by pressure over the bell of the stethoscope; but Hamman's sign rapidly became less intense after the fourth day, and by the seventh day had disappeared entirely. Cardiac dullness was normal and the apex impulse became palpable in the fourth left anterior intercostal space within the midclavicular line after the second day. No remarkable variation in retrosternal dullness was ever detected. Although the muscular and valvular heart tones (during the first 5 days) were difficult to evaluate because of the superimposed crepitation, it seemed fairly definite that the first sound at the apex was muffled and of poor quality. On the second day, the pulmonic second sound was loudly accentuated during inspiration. It was thought that a soft blowing systolic murmur could be heard at the apex, and a short, rather harsh, protodiastolic bruit heard in the third left intercostal space in the parasternal line. These were quite variable, but at times readily apparent during the first 3 days of the illness, after which they were never heard. On the second day, a loud fluidlike click could be elicited by manual pressure over the apex, and could be heard by the unaided ear some 2 feet from the chest. By stethoscope this sound, separate and distinct from all others, was loudest in the fourth left intercostal space in the parasternal line. The "pericardial knock" of left pneumothorax came to mind—our only indication that such might have coexisted with the mediastinal emphysema. After the seventh day of the illness no abnormalities were found on physical examination of the chest.

On admission, the leukocytes numbered 13,200 per cubic millimeter, the erythrocyte sedimentation rate (Cutler) 9 mm. per hour; the electrocardiogram disclosed only low voltage in the QRS complex of lead 1. Subsequently, the leukocyte count ranged between 5,900 and 9,650, and the sedimentation rate between 5 and 7 mm. per hour. Electrocardiograms on the third and eighth days of the illness showed no evidence of myocardial damage, and the QRS voltage definitely had increased. On the first day of the illness, an attempt was made to secure a portable roentgenogram of the chest. This AP projection was techni-

cally poor; however no abnormalities were noted. A teleo film taken on the fifteenth day was negative. The blood Kahn reaction was negative; erythrocyte count, hemoglobin level, and urinalysis were normal.

COMMENT

The differential diagnosis lay between coronary occlusion with myocardial infarction and spontaneous mediastinal emphysema, with or without a small left pneumothorax. On admission the patient appeared sufficiently ill to give the impression of myocardial infarction. It is a matter of common knowledge that young persons in the early twenties can and do have coronary artery occlusion. The patient, when first seen, appeared and acted like one with an acute coronary occlusion—and would have been so diagnosed but for (*a*) the initial normal blood pressure and (*b*) the raucous noises heard in the mediastinum.

Salient differential features and developments which led to our diagnosis of spontaneous mediastinal emphysema were: (*a*) Absence of circulatory shock; (*b*) a normal sedimentation rate, temperature, and leukocyte count; (*c*) absence of any evidence of myocardial infarction in serial electrocardiograms; (*d*) the age of the patient; and (*e*) the mediastinal crepitation, which scarcely could have been interpreted as a pericardial or pleuropericardial rub.

The case was not without cryptogenic aspects. The use of amyl nitrite gave temporary relief by probably overcoming the reflex coronary vasospasm which may well have followed presence of air in the pulmonary interstitial tissue and in the mediastinum. The poor quality of the heart tones and the transitory systolic and diastolic murmurs were probably due to cardiac embarrassment and alteration of cardiodynamics, also because of mediastinal air pressure on the heart, great vessels at the base, and on the pulmonary vascular trunks.

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Medical Care On Wartime Operating Submarines

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CHARLES W. SHILLING, *Captain (MC) U. S. N.*

IN ORDER to properly appreciate the submarine medical problem it is necessary to understand that although a submarine does not ordinarily carry a doctor, its complement does include a Hospital Corpsman, whose training is akin to, though more extensive than that of a skilled civilian first-aid man; but who on a submarine, is necessarily the medical officer, the dentist, the nurse, and the chaplain all rolled into one.

A rigorous selection program chooses a trained Hospital Corpsman from the general service who is at least 20 years old, is a high school graduate, has above average intelligence, and, as nearly as can be determined, is an emotionally stable, a psychiatrically, and a physically sound adult. His additional training is designed to equip him so that he can diagnose and treat the more common illnesses, perform routine minor surgery and, in the absence of a medical officer, care for major surgical emergencies which may arise. There are under his care approximately 8 officers and 75 men.

To a civilian physician this may sound impossible of achievement and echo of charlatanism. We are confident, however, that the following performance report will speak for itself and require no apology. The qualified submarine Hospital Corpsmen were a credit to the Medical Corps; and they were often, by all odds, the most valuable, and at the same time, the best liked men on the "boats."

The story of medical care on a wartime operating submarine in the most complete form possible will be considered in this article. The primary source of material, admittedly incomplete and sometimes inadequate for statistical study, is the official patrol report made by the commanding officer of each submarine at the conclusion of a war patrol. Of more than 1,500 war patrol reports, 1,489 were studied in preparing material for this article. Additional material has been gathered from official medical records, from personal experience of

the authors, and from discussions held with many returned officers and Hospital Corpsmen of the submarine force.

PREVENTIVE MEDICINE

Preventive medicine on a submarine includes the usual shipboard problems of supply and purity of food and water; the proper stowage, refrigeration, and preparation of food; the inspection of food handlers; the disposal of garbage and other waste material; the sanitary condition and adequacy of the toilet and wash room facilities; the general health of the men; and instruction in first aid.

In addition to these routine measures, the submarine Hospital Corpsman must be familiar with the medical aspects of the air conditioning problem, such as oxygen supply, carbon dioxide removal, temperature and humidity control, and potential hazards of noxious gases. He must also be familiar with the submarine escape problems and capable of instructing others in the use of the submarine escape appliance, the "lung."

CONDITIONS REPORTED FROM COMBAT SUBMARINES

Hospital Corpsmen attached to submarines on war patrols reported five most commonly encountered medical conditions as acute communicable diseases, injuries, disturbances of the digestive tract, diseases of the skin, and diseases of the urogenital system. The incidence (per thousand) of diseases and injuries reported from submarines and destroyers in 1944, according to the statistical division of the Bureau of Medicine and Surgery, is presented in table 1.

TABLE 1.—*Incidence of diseases and injuries by class of disability, destroyers and submarines,¹ 1944*

Class	Submarines	Destroyers
Injuries	39.9	39.6
Communicable diseases transmissible by oral and nasal discharges	33.9	40.8
Veneral diseases	30.8	31.3
Diseases of the digestive system	24.1	23.4
Other diseases of the infectious type	16.9	22.1

¹ Exclusive of combat injuries.

Cold statistics cannot tell the true story, however, for the illness of even one man in so closely an integrated crew prevents flexibility of the organization and often produces considerable inconvenience. This is particularly true when it becomes necessary to engage in prolonged periods of contact with the enemy with a crew whose efficiency and endurance have already been reduced.

The incidence (sick or man-days lost) and the cumulative effect of acute respiratory diseases aboard submarines on war patrols assumed

military significance in the last war. Installation of germicidal lamps in the ventilation system of submarines was considered. Actually a battery of such lamps was installed on one submarine but unfortunately eventual loss of the ship prevented an adequate and complete evaluation of its efficiency.

Medical conditions

Acute communicable diseases aboard submarines.—As shown in table 1, the incidence of acute communicable diseases was reported in over 400 patrols, on 211 of which it accounted for 1,068 sick or man-days lost. Despite the obvious incompleteness of the reports, some details in regard to these illnesses are pertinent and of interest.

Colds (including "acute catarrhal fever") and "sore throats."—These two diseases were very common, and relatively speaking, few submarine patrols were made without a varying incidence of them. In some 140 patrol reports they were thought sufficiently important to justify special notice. Because of their interest and for the sake of completeness, a few of these comments have been taken from the patrol reports and will be quoted and discussed in the following paragraphs.

It is quite natural to assume that men returning from leave brought the germs and viruses of these infections aboard the submarine. The factors involved can be traced to unavoidable contacts with shore based personnel, lowered individual resistance, and inclement weather during the training periods, as is indicated by the following excerpts:

There were numerous colds aboard when we left Australia.

The epidemic of mild "Cat fever"¹ that started prior to leaving Pearl Harbor continued throughout the patrol involving 20 men, 7 of whom were turned in from 3 to 8 days.

On departure, two-thirds of the crew had colds which persisted for several days with noticeable reduction in efficiency.

Shortly after leaving Pearl Harbor several cases of severe septic throats occurred—believe contracted from an epidemic raging at the submarine base upon departure.

Submarines on patrol commonly reported "epidemics" of colds, sore throats, and so forth within the first 1 to 3 weeks of the cruise, not infrequently before the submarine reached her operating area.

A small epidemic of colds (16 colds, 4 tonsillitis, 2 earaches, 2 "Cat Fever") occurred in the first 2 weeks.

A mild epidemic of colds and sore throats occurred in the first week involving 80 percent of the officers and crew.

¹ Short for the official Navy diagnosis of Catarrhal Fever, Acute, which is a common cold (Standard Nomenclature of Diseases).

The usual run of sore throats and minor colds in the first 2 weeks.

As the patrol progressed, the cold germs gradually retreated.

Generally these infections were short-lived, reaching their peak in the first and second weeks and disappearing thereafter. Upon occasion, however, as noted below, they persisted throughout the patrol.

Approximately 70 percent of the crew suffered from colds and "Cat Fever." The combination of colds, lack of sleep, and lifeguarding² resulted in a certain nervousness and irritability which fluctuated in intensity with the magnitude of the three items mentioned.

A mild epidemic of colds occurred in the latter part of the patrol, believed due to lowering of resistance because of the length of the run.

There were four cases of mumps, one case of measles, and two cases of "Cat Fever"—the latter being on the sick list on arrival at Midway at the end of the patrol.

Patrols made in northern areas of operation particularly in winter, were especially apt to be handicapped by these acute infections. As indicated by the following excerpts the operating conditions encountered in these areas were extremely unfavorable.

With 27 days spent submerged the boat was cold and damp; health was only fair, 50 percent of the crew had colds.

The temperature in the conning tower varied between 28° to 32° F.; bridge personnel were constantly drenched with salt water spray, hail, and snow; ice accumulated 2 inches thick on the boat at night.

Operating in a cold climate with an average temperature of 34° F. eliminates the generally encountered fungus infections but reciprocates with an increase in the number of minor colds.

Also, colds were commonly experienced, as observed in 26 reports, with the passage of the ship from warmer climates to cooler operating areas, particularly if the 3 weeks' refit period had been conducted at a tropical or semitropical base.

An epidemic of colds broke out as the result of the sudden change in climate from Guam to the cold dampness of the weather in the Japanese Sea made in little more than a week.

Ninety percent of the crew had colds due more or less to the sudden change of climate from Pearl Harbor to Dutch Harbor.

However, the reports of 43 patrols made in tropical waters were concerned with the incidence of acute respiratory infections.

It was uncomfortably hot on all-day dives. Health was fair with many colds. Two were admitted to the sick list with "Cat Fever."

² Air-sea rescue patrol for downed aviators.

A high incidence of coughs and colds and two cases of "Cat Fever" coincided with our passage across the Equator.

In a few instances the onset of colds was related to submerged operations, as noted in the following excerpts.

After the first all-day dive of 13 hours' duration, 20 men developed colds.

A severe epidemic of common colds was experienced at the start of daylight submerged patrolling.

Ample evidence exists, however, that once the colds had run their course, everyone became more or less immune to the common offending organism. Should, however, a new strain of organism be introduced, difficulty was again experienced:

Four cases of "Cat Fever" were observed to develop after a short stop-over² at Saipan.

One submarine, having sunk an enemy submarine, rescued one survivor:

The German had a cold when captured. He brought a new variety of cold germs aboard resulting in another epidemic of colds and sore throats.

Another submarine participated in the mass rescue of British and Australian prisoners of war. Some of these men developed an acute bronchitis within a few hours after they were taken aboard the submarine. Nine, when x-ray facilities were available, showed evidence of acute broncho-pneumonia.

Other acute communicable diseases aboard submarines.—Other types of acute communicable diseases (classified according to Navy diagnostic nomenclature) reported were: influenza, 23 cases; mumps, 21 cases; measles, 20 cases; pneumonia, 12 cases; chicken pox, 2 cases; meningitis, 2 cases; and scarlet fever, 1 case. The fact that submarines on patrol were relatively free of mass illnesses such as these can be credited to luck and to the sagacity of the Hospital Corpsmen in treating and isolating, so far as possible, their patients from the rest of the crew. Fifteen cases of malaria and five cases of dengue fever occurred; these developed following refits in tropical ports. A number of submarines experienced varying incidence of what was apparently acute infectious jaundice—22 cases having occurred on 14 patrols. It would appear that some of the cases were contracted during refits on Guam.

The tuberculosis problem aboard submarines.—The general problem and the incidence of tuberculosis aboard submarines was of concern to interested physicians throughout the war. Some of their com-

² A matter of hours.

ments taken from official Submarine Force documents may be of interest.

The expansion of personnel brought into contact many individuals with quiescent or minimal tuberculous lesions not readily discernible on routine physical examination.

Prolonged residence in specialized craft such as submarines, where sunlight is nil and outside ventilation is reduced to only parts of each day, were ideal for activation of quiescent tuberculosis and the close association in sleeping and working spaces was even more ideal to droplet spread of disease, enhanced by the presence of increased heat and humidity.

Recognitions of the problems involved led to the inauguration of periodic chest X-ray examinations of submarine personnel.

These surveys were accomplished at Pearl Harbor, T. H.; Mare Island, Calif.; and New London, Conn. Table 2 is a summary of such examinations at Pearl Harbor, T. H., submarine base. Excerpts from the Pacific Submarine Force medical officer's report add interesting sidelights to the facts presented in the table:

In only one vessel, where an open case was found, were there any additional cases that were considered to be infected from the open case.

Results of the program * * * are very gratifying to the Force medical officer, especially after the misgivings that accompanied reliance on tuberculin tests for crews in which tuberculosis was found prior to the establishment of the photofluorographic unit.

It is regrettable that two of the tuberculosis cases occurred in medical personnel, one in a medical officer and one in a submarine Hospital Corpsman.

TABLE 2.¹—*Tuberculosis*

[The following summary shows the results of x-rays of all Submarine Force personnel between 1 November 1944 and 1 October 1945. The complement as of 1 July 1945 was 21,522 enlisted men and 3,911 officers (including submarines, tenders, bases, etc.). 23,232 men were examined by photofluorograms. The incidence of tuberculosis (per 1,000) in the Submarine Force was 0.43 percent.]

PRIMARY TYPE		
	Cases	Transferred
1. Stable.....	11,411	0
2. Unstable.....	2	0
REINFECTION TYPE		
1. Minimal:		
Active.....	61	61
Inactive.....	41	18
2. Moderately advanced:		
Active.....	20	20
Inactive.....	1	1
3. Far advanced:		
Active.....	1	1
Inactive.....	0	0
Total.....		101

¹ Through the courtesy of the Force medical officer, of the Submarine Force, U. S. Pacific Fleet, Capt. O. D. Yarbrough (MC), U. S. N.

The incidence of tuberculosis in the entire fleet (based upon 185,000 photo-fluorograms) was 0.32 percent.

The incidence of tuberculosis in submarine crews and in surface craft crews is presented in table 3, as it was found in a survey taken at the Mare Island Naval Shipyard, Calif.

TABLE 3.^{1,2}—*Tuberculosis**Submarines*³

Month	Number x-rayed	Hospitalized for tuberculosis	Indications for clinical study
August	246	1	2
October	275	1	0
December	451	0	0
Total	972	2	2

*Surface Craft*⁴

August	2,978	12	4
October	865	1	0
December	1,071	3	1
Total	4,914	16	5

¹ Through the courtesy of Commander J. E. Compson (MC), U. S. N. R., senior medical officer, Mare Island Naval Shipyard, Mare Island, Calif.

² The 3 months shown in this report were taken at random from 1945 records.

³ Incidence 0.41.

⁴ Incidence 0.42.

The statistical division of the Bureau of Medicine and Surgery has reported the incidence of all forms of tuberculosis occurring in submarine personnel as 7 cases in 1943 (0.8 per 100), and 8 cases in 1944 (0.6 per 100). These figures, in combination with those shown in tables 2 and 3 indicate that the incidence of tuberculosis among submarine personnel was very low. The incidence of the disease among incoming university students—presumably never subject to previous screening—is said to be about 0.7 per 100.

Diseases of the digestive system aboard combat submarines.—As noted in table 1, diseases of the digestive system accounted for 24.1 admissions per thousand to the sick list. According to the war patrol reports the 4 most commonly encountered conditions of this class were acute gastro-enteritis, chronic constipation, acute appendicitis, and "Diagnosis Undetermined (Abdominal Pain)." Most cases of gastro-enteritis and practically all cases of constipation were not admitted to the sick list. The bulk of sick days attributed to this class (578 of a total of 995) were due to acute or chronic appendicitis.

Gastro-enteritis and food poisoning.—Careful analysis reveals notations concerning food poisoning in only 34 patrol reports of the total of 1,489 patrol reports studied. In only 9 of these was food definitely

incriminated. Offending agents were listed as canned orange juice, canned sardines, custard pie, beef, surveyed stabilized cream, spoiled chicken, tinned hash, and tinned salmon. The remaining reports mentioned the occurrence only in general terms.

That mass food poisoning aboard an operating submarine may, by incapacitating the crew, cripple the striking force of the ship is illustrated by the experience of one submarine, where, at least in part such a mass illness was responsible for the submarine's inability to carry through a successful attack against a Japanese carrier. Food poisoning occurred on 7 to 9 July believed due to frozen chicken (which was spoiled) served for dinner on 7 July. Two-thirds of the crew and all of the officers were involved with diarrhea and vomiting. Two men were still vomiting after 5 days and were not fully recovered 10 days after they had been stricken. The submarine sighted a carrier on 10 July and the following comment concerning the attack was made:

Loss of depth control on the one attack made was most unfortunate in that it prevented firing at carrier. The order to make ready the tubes was given rather late; this was combined with personnel errors in hurriedly preparing all tubes. At this time nearly all of the crew was handicapped by sickness from the food poisoning.

Constipation.—Constipation, being considered almost an occupational disease among submarine personnel, is generally taken for granted. The following excerpts from patrol reports illustrate well its frequency.

Constipation was the most common complaint, being most prevalent in the first 2 weeks of the cruise; after this period the request for laxatives dropped off to the level observed in normal operating (peacetime) conditions.

The most common complaint was constipation, involving 90 percent of the crew.

This Hospital Corpsman stated that on a 56-day patrol with a crew of approximately 75 men he had dispensed 3 quarts of mineral oil, 1 pint of castor oil, 2 pounds of Seidlitz powder, 3 bottles of cascara and 20 soap and water enemas.⁴

Constipation, in submarine personnel, is associated with the problem of diet (the small amount of available roughage, insufficiency of fresh fruit, excess of carbohydrates); improper eating habits; irregularity of meals; lack of sleep; lack of exercise; motion of the ship; and heads (toilets) which are sometimes difficult to operate. When intelligently managed by the Hospital Corpsman, constipation was not, however, an insurmountable problem.

⁴ First patrol of the ship early in the war. Admittedly over-emphasized and over-treated.

Venereal Disease.—The Manual of the Medical Department of the U. S. Navy states that a man with an active venereal disease shall be disqualified for entrance into the submarine service and that a proved history of syphilis shall be sufficient to disqualify. Men already serving aboard submarines who contract venereal diseases are to be transferred to the tender or hospital facility ashore as soon as possible. The occurrence of diseases of the urogenital system among submarine personnel on war patrols has been summarized from the official patrol reports and is presented in table 4.

TABLE 4.—*Diseases of the urogenital system*

Diseases	Number of patrols reporting	Number of cases reported	Number of sick days reported
Gonorrhea, urethra, acute.....	37	100	45
Urethritis, acute, nonvenereal.....	33	67	26
Gonorrhea, urethra (DU) ¹	25	56	31
Prostatitis, unclassified.....	8	24	6
Penile lesions (DU) ¹	18	20	2
Syphilis.....	11	16	50
Renal disease (DU) ¹	10	15	12
Calculus, urinary system.....	12	13	27
Epididymitis, acute, and orchitis, acute.....	10	11	23
Cystitis, acute.....	5	5	12
Balanoposthitis.....	1	1	1
Total.....	170	337	229

¹ DU means Diagnosis Undetermined, indicating that it was impossible to be absolutely certain or to prove the diagnosis. It should be pointed out that the reporting, especially for gonorrhea, urethra, is undoubtedly incomplete as medical facilities of submarines do not include microscopes.

The following excerpts from patrol reports concerning venereal disease aboard submarines are quoted for their interest.

Four men with gonorrhea were taken to sea^a and given a short course of sulfathiazole tablets orally as prescribed and furnished by a Dutch doctor at Soerabaja. The treatment was apparently 100 percent effective in 3 of the cases and partially effective in the other case.

One case of gonorrhea appeared shortly before arriving at Saipan en route to the patrol area. Sulfa drugs were administered aboard and he was treated with penicillin upon arrival at Saipan. The patient continued the patrol with no apparent ill effects.

There was one suspected case of chancroid which developed about 3 weeks after departure on patrol. Subject man was isolated to the extent necessary to prevent contamination of other personnel.

One case of venereal disease developed after departure Fremantle that required transfer at Darwin en route north due to the fact that his health record contained the statement that he should not be given sulfa drugs for treatment of any illness.

^a Early in 1942.

One case of Diagnosis Undetermined (syphilis) was noted and precautionary measures were used until a positive diagnosis could be established.

The presence of pediculi and scabies among the crew caused further discomfort.

Upon one occasion a submarine, at the conclusion of a long patrol, underwent a 2 weeks' refit period at an advanced base. When the ship arrived post-patrol physical examinations were confined to a discussion with the Hospital Corpsman. A few weeks before the termination of the next patrol one man who had made all patrols advised the Hospital Corpsman of a venereal disease which he had concealed for a period of at least 6 weeks and during the last refit. Examination disclosed the presence of multiple penile and perineal lesions. When the submarine finally came alongside a tender ship these lesions were easily proved to be syphilitic. In addition, the patient had an acute cerebrospinal syphilis. The entire crew were given blood serological tests for syphilis, all of which were negative. The incident is reported in such detail to emphasize two points: (a) Apparently aboard submarines, the hazards of contracting a venereal disease by casual contact are at a minimum, despite the necessity of sharing bunks and the limited lavatory facilities; and (b) post-patrol physical examinations while admittedly a chore, and often productive of little in the way of pathology, were nonetheless worth doing well for the occasional time they did pay dividends. Such cursory "examinations" as described above may well, upon occasion, prove embarrassing to the examining physician.

Skin diseases as related to air conditioning aboard submarines.—Most fleet-type submarines were equipped with two, 4-ton air conditioning units installed in the ventilation supply lines. As the war progressed these were supplemented by additional cooling and blower units. Without air conditioning and adequate ventilation (lack of installations, lack of refrigerant, insufficient number or malfunctioning cooling units, and so forth) the habitability of a submarine on an active war patrol may become so poor that through material defects and/or lack of personnel endurance and efficiency, the safety and ability of the submarine to carry out her mission may be seriously compromised. The following excerpts from reports of war patrols made without air conditioning, or with inadequate air conditioning, have been selected to emphasize this point and to show the relation of excessive heat and humidity to skin disease and heat exhaustion. Actually, only a very few patrols were made under such harrowing conditions.

Shortly after midnight the * * * dove at nearly full speed on four engines * * * the interior of the ship being as hot as a fireroom that has been secured. Noisy air conditioning equipment was secured as we went in across

the bow of the escort. Temperature in the maneuvering room was 130° F. and the engine rooms were about the same. * * * At about 2 a. m. men in these two compartments were near prostration from the heat; one man was already receiving treatment. The men on the wheels and planes were being rotated every 5 to 10 minutes by which time they were totally exhausted. Men had never before been seen to sweat so profusely. There was cheerful chatter by the men on station about how much Tojo had to pay for his high grade of depth charging, but response was slow and acuity dull. Errors were prevalent. It was evident that the ship was no longer in condition to fight or to defend itself. * * * At 2:35 a. m. the executive and engineering officers advised me to surface before dawn to rehabilitate the ship and crew if at all possible.

Due to faulty air conditioning units the boat was oppressively hot and humid. * * * After two weeks of all-day submergence all the bunks were wet and sticky. Clothing in lockers * * * were green with mildew. Temperatures well over 100° F. with high humidity levels made it practically impossible to get any rest while submerged. There were two cases of heat exhaustion. The entire crew had prickly heat. Some cases covered the entire body. Thirty percent * * * developed some type of fungus infection.

Following repair of the air conditioning system on the succeeding patrol the commanding officer commented:

At last we have found out that submerged time need not be a taste of hell—this is the first patrol this boat has been anywhere near livable. General improvement in the condition of personnel and reduction of heat rash and skin diseases was quite noticeable in comparison with previous patrols.

On another boat on which it is presumed the air conditioning must have failed completely we find that:

Ninety percent of the officers and crew has "prickly heat," 68 percent "Guam blisters,"⁶ 20 percent had boils and 12 percent had fungus infections of the ears.

Psychiatric Casualties

A complete and detailed report concerning psychiatric casualties aboard submarines on war patrols has been published elsewhere.⁷ In the present report, for the sake of completeness the authors would like to briefly review some points which they made in that article.

The frequency of psychiatric cases was unbelievably low, with only 56 occurring in the 1,489 submarine war patrol reports available for study. Only 2 cases of epilepsy were recorded, and 5 cases that could be classified as true psychosis. This is truly a remarkable record.

The cases which did occur were handled efficiently:

On one patrol a case of mental derangement occurred, with repeated attempts at suicide. The Pharmacist's Mate handled the case with skill, restraining the

⁶ Probably dermatophytosis.

⁷ DUFF, IVAN F., Commander (MC) U. S. N. R., and SHILLING, CHARLES W., Captain (MC) U. S. N.: *Psychiatric Casualties in Submarine Warfare*. *Am. J. Psychiat.* 103: 607-613, Mar. 1947.

patient with sheets, giving sedatives, and bringing him to port without mishap, in spite of the patient's acute depressed state.

It is believed that this remarkable record may be attributed to: (a) Careful selection of candidates for the submarine service; (b) thorough training of submarine personnel and elimination of the unfit; (c) morale, or esprit de corps of the submarine; (d) pre- and post-patrol physical examinations to determine fitness for continuance on patrols; (e) generous use of rest camps, and rotation to the "States" for leave and to pick up "new construction" submarines; and (f) confidence in the submarine, their officers, and their shipmates.

SUMMARY

On submarine war patrols the most common medical conditions which the Hospital Corpsmen were called upon to treat were acute communicable diseases, disturbances of the digestive tract, and diseases of the skin and urogenital system. The incidence of these conditions aboard submarines when compared with surface craft (destroyers) appears to be about the same.

Relatively few submarine patrols were made without a varying incidence of acute upper respiratory infections commonly experienced in the first 2 weeks of operations. These could be traced to contact with shore-based personnel, inclement weather conditions during training period immediately preceding the patrol, and rapidly encountered changes in climate. Such immunity thereafter afforded the crew did not necessarily protect them from strains of organisms introduced from the "outside" world.

The incidence of tuberculosis among submarine personnel is low (0.43 percent) and does not vary significantly from the general fleet (0.32 percent).

That the over-all method of selecting, training, and handling submarine personnel was satisfactory, is evidenced by a very low rate of psychiatric break-downs.

Venereal diseases, when sulfonamides and penicillin become available, present no special problems aboard submarines. Despite the necessity of sharing bunks and limited lavatory facilities, the hazards of contracting syphilis by casual contact are at a minimum aboard this type of craft.

Submarine Hospital Corpsmen well may be proud of their performance record throughout World War II. These men, carefully chosen, patiently and thoroughly trained, aptly and often brilliantly shouldered the immense responsibilities that were theirs. A significant indication of what can be done by training lay personnel to handle medical problems is shown by the excellent performance of duty by these men.

THE RECOVERY OF THE PATIENT
IS THE FIRST CONSIDERATION OF
THE PHYSICIAN.—Hippocrates.

EDITORIALS



Citizenship and Medicine

The curriculum in our schools and colleges calls for years of compulsory preparatory study of the arts and letters, but the educational system makes no provision for compulsory preparatory training in citizenship. How then can students, as citizens, be expected to fully appreciate and carry out their responsibilities in the political activities of the State and Government?

Medical and dental students, and students in the sciences allied to medicine devote so many years of preparatory study in the general sciences at the expense of study in political science, that they become oblivious to local or national political affairs and to their civic responsibilities and duties. Later in life, as professional men, they consider themselves removed from the political sphere and are prone to regard themselves as disinterested spectators in the political arena. Their college education has prepared them to compete successfully in economic life and has enabled them to reach a preferred occupational and social status; but, as a rule, they have neither been prepared for nor have they the inclination to attain a commensurate plane in the political life of the community, state, or government.

A democratic form of government is an instrument of the citizenry. It is the will of the citizen which creates and imposes on him and on all citizens alike, the laws of the community, state and government. It is the citizen who creates the policies of government bearing on foreign relations. It is therefore the responsibility of the citizen to provide the means whereby those laws and policies can be put into effect. Each citizen must provide a proportionate share of the financial, political, and personnel requirements of government, according to his means and capabilities and according to his power of reason. This is his responsibility during peace as well as in time of war.

During periods of national emergency, professional men always respond to the call to duty and serve in the military forces with zeal, courage, and devotion. But during periods of peace they shrink from the thought of identifying themselves with and serving in those same branches of Government, although as citizens it is their responsibility to serve the needs of government at all times; and there is no nobler occupation than in the service of one's country.

As James Bryce so aptly stated "Whoever wishes to exert his will as a member of the community must not only obey the will of the community, but must also bear his share in serving it. Benefit and burden, power and responsibility go together. Duty is the correlative of right."



Pro Bono Medico¹

A pleasant rapport between the physician and his patient is one of the intangible, yet very real, compensations from the practice of medicine.

It has been whispered abroad that a career in military medicine is devoid of human interest because the very nature of the service is said to prevent close personal contact between the physician and his patient; that the practice of medicine in the Medical Corps is encumbered and all but suffocated by restrictive regulations; and that the medical officer is beset with intellectual lassitude and characterized by inconstancy of purpose.

To demonstrate that such charges are fatuous, unfair, and unfounded is sufficient reason for this article. But there is another perhaps more vital reason behind this presentation, and that is to assist the young medical officer in planning his future career.

Every young medical man would be well advised to draw up a double-entry ledger, listing the advantages and disadvantages of private practice against comparable values in military medicine. This the writer has done on several occasions, and each time he has found the balance heavily in favor of a career in the service. That is why he recently transferred from inactive status in the Naval Reserve to the Regular Navy, and returned to active duty. His decision to accept a commission as a medical officer in the United States Navy was arrived at after deliberate consideration based upon a background

¹ With permission of the Proceedings of the U. S. Naval Institute.

of six years of private practice before the war; some four and one-half years on active duty in the Naval Reserve; and since the war an acquaintance with postgraduate medical education, its scope and organization, and a more intimate and intensive association with clinical and biological research in a large medical center.

Before making an irrevocable decision to separate himself from the naval establishment every young medical officer should consider the many detractions inherent in the practice of medicine in civilian life. These are hidden beneath the surface, but they are nonetheless real and of vital importance.

When one enters the waiting room of a busy practitioner, and is greeted by a socially acceptable receptionist, or by an efficient and well-trained nurse, and finds several patients waiting to see the doctor, one thinks of the lucrative practice enjoyed by this up-to-date physician, of his present professional stature, and of the potential increase in his earning capacity in the years that lie ahead. One also may be favorably impressed with the physician's apparent authority over his patients, who presumably always carry out the doctor's orders.

But are these first impressions more apparent than real? First of all, one has little concept of the actual cost to the physician of maintaining a desirable "show-window," unless and until he must meet payments of these bills from the fees he collects in private practice. All too frequently, the ratio between services rendered and income realized therefrom approaches an inverse ratio. Yet the overhead of maintaining an office with modern equipment and adequate personnel continues apace; and this does not take into account the indirect cost to him of the numerous charity services he renders willingly and in good faith every day.

Second; is the average patient so ready, willing, and able to carry out the physician's orders and directions promptly, and to return at the appointed hour for follow-up observation and study? For that matter, will the physician in private practice be able to keep his appointment with his patient?

The interruptions in a physician's daily life are legion, many are irritating, and a few are inexcusable. Yet he is a public servant and is expected by the public to answer, or at least cover, every emergency call regardless of the hour and regardless of prior professional or social commitments. Furthermore, there is a very wide latitude in the definition of the word "emergency" among the laity.

Many young and eager physicians rapidly develop an active practice by dint of a combination of hard work, honesty, and good judgment, and to all outward appearances are soon on the road to financial and professional success. But the larger one's practice becomes, the greater the demands on his physical and mental energy. Indeed he

may rapidly approach an impasse where the daily grind and routine drudgery prevent adequate opportunity for that physical rest and mental relaxation so requisite for maintaining and replenishing the physician's physical and nervous energy upon which the next unexpected and unpredictable emergency may place an unreasonably heavy burden and responsibility.

One of the problems facing every young man embarking on private practice, relates to his future professional attainments and a desire to specialize in the field of his particular interest. This he can accomplish only by keeping abreast of current medical literature, by serious and sustained study of textbooks and monographs, by attendance at medical meetings (often at considerable distances from his location), and by taking postgraduate courses at various clinical centers in this country and abroad.

All this is ideal, but it can be attained only by considerable sacrifice of the physician's time and money and by constant self-denial of his social and extracurricular activities. Furthermore, such graduate study and training as the physician can afford is doubly expensive since in addition to the expense of tuition and for room and board away from home, must be added the hidden cost of his absence from practice. In addition, the ever-present overhead of maintaining home and office during his enforced absence continues unabated.

Aggressiveness on the part of a young physician in attempting to improve his professional knowledge and clinical ability may be interpreted as "showmanship" by some of his associates who are either unable or unwilling to make such financial sacrifice for such spiritual and professional attainment. One is reminded of Osler's "Alabama Student" who was severely criticized by his colleagues and by his community for undertaking postgraduate study in Europe rather than remaining at home and farming his practice as a country doctor.

Moreover, the young physician should contribute a portion of his time to social service, and frequently he will be called upon to take an active part in community drives, church work, or club endeavors. Here again, he is open to criticism if he takes no active interest in problems of community welfare, since it is from the members of his community that he earns his living. Conversely, he may be censured as a "politician" if he devotes too much time and effort to community projects, or if he holds public office.

Finally, the physician in private practice must adequately meet professional competition, which in the larger areas of population and in the teaching centers may be very keen indeed. He will be expected to devote several hours daily, without remuneration, to dispensary duty or ward service in the hospitals, and yet he may experience diffi-

culty in obtaining membership privileges on the hospital staff unless he is certified as a "specialist" by one of the Specialty Boards. Faculty appointments at most medical schools are at a premium, and academic advancement is usually predicated on proved ability as a teacher, or clinician, or in research, or upon a fortuitous combination of all three and arrived at only after years of patient apprenticeship. The path of academic medicine is both steep and narrow, and many fall by the wayside.

A career in naval medicine offers many of the advantages of a clinic. Of even greater significance is the tacit assumption that each medical officer is a "stockholder" in the Medical Department and hence "owns" a cooperative share in the Naval Establishment. And every officer may take just pride in this intangible, yet very real investment in the greatest team on earth, the United States Navy.

Opportunity for self-improvement is unlimited in the Navy. Indeed, the naval service has always appealed to the writer as a continuous postgraduate professional course which also includes courses in self-discipline and character building. During these active years of instruction and construction, professional recognition and promotion in rank are commensurate with the development and attainment of maturity as evidenced by an officer's growing ability to assume responsibility and execute his obligations in a manner creditable to the high standards of the naval service.

Indeed, such motivating forces are not indigenous to the United States Navy alone, but rather permeate and influence the lives and philosophy, and color the heritage of all seafaring men.

Many outstanding examples of virtue, honor, patriotism, and subordination are to be found in the Medical Corps of the United States Navy. Such officers subconsciously contribute much to the morale of the naval service in general and to the esprit de corps of the medical profession in particular. Their character and conduct are worthy of emulation by junior medical officers, since such mature qualities reflect credit upon that intangible pride of service which emanates from years of discipline and sacrifice for a noble purpose.

From a professional standpoint, the advantages of military medicine are legion. All naval hospitals and medical dispensaries contain medical libraries where current professional textbooks, monographs, journals, and periodicals are available. To the physician in private practice, the great costs of ownership and subscription to such a wealth of medical information would be burdensome.

In addition to the library privilege, the service also provides the medical officer adequate office facilities, the best medical and surgical instruments, and modern X-ray and laboratory equipment. Hospital Corps assistants, secretarial personnel, administrative experts, and

graduate nurses who themselves are commissioned officers in the Navy Nurse Corps, assist the medical officer in the discharge of his duties.

But what is really more important is the implicit understanding that the medical officer shall treat the patient in accordance with his best professional judgment and clinical acumen. No expense is considered too great relative to the costs of special studies, consultations, roentgenograms, and laboratory tests necessary to determine the correct diagnosis, and indicated therapy. In other words, the medical officer takes full charge of the patient, establishes the diagnosis, and provides treatment appropriate for the welfare and best interests of the patient. Here is positive proof of the preservation of the doctor-patient personal relationship in military medicine.

That the importance of postgraduate study and training has received renewed impetus since the war is attested by the fact that the Navy has 263 medical officers receiving residency training in 9 naval hospitals in special fields of medical and surgical practice leading to eligibility for examination by one of the American Specialty Boards or membership in the Academy of General Practice.

There are now some 16 such certifying boards, each composed of outstanding experts in the various specialties who maintain and promote the highest standards of training and proficiency in all fields of medicine.

The fundamental purpose of "certification" by any one of the specialty boards is "to insure to the public, both lay and medical, for its protection, that physicians claiming to be specialists, with presumably special proficiency in one or another branch of medicine, actually possess the qualifications they claim." This presupposes special training and demonstrable capability along certain lines of work. Suitable evidence of this is the ability of an individual physician to satisfy an examining board in his specialty about his postgraduate training and then to pass successfully the examinations for certification as a specialist.

Military medicine was quick to grasp the significance of specialization and today the positions of "Chief of Service" in the larger naval hospitals are assigned to medical officers who have been certified as specialists by one of the American Specialty Boards, as outlined previously. This concept and its fulfillment exert a threefold advantage. First, top-flight medicine and surgery are constantly available for the welfare of the patient; this, in turn, promotes hospital staff morale and enhances a desirable rapport between the patient and his physician; and finally, the medical officer under instruction can receive credit for training by a "Board man," which credit accrues toward meeting the basic time requirement for certification.

Thus the professional quality of medical service in the Navy is

constantly subject to revision and improvement, and the Bureau of Medicine and Surgery will be satisfied with nothing less than the best.

A new policy relative to the value and significance of basic research is apparent throughout the Navy. This applies not only to endeavors in chemistry, physics, mathematics, electronics, architecture, engineering, but to clinical medicine as well. Witness the remarkable advances in aviation medicine and submarine medicine, neurosurgery, orthopedics, and plastic surgery, neuropsychiatry and aural rehabilitation, as well as the newer knowledge of chemotherapy, enzymes, antibiotics, and radioisotopes. Indeed, a working knowledge of the basic sciences, especially as it applies to physiology, is essential to a grasp of the fundamental reasoning upon which the practice of medicine and the ancillary specialties are based and to which the concept of medical research is firmly anchored. To this end, young medical officers should obtain, whenever possible, additional instruction in the basic sciences, while other officers may elect short review and refresher postgraduate courses in the clinical application of the basic sciences.

As a result of these broad and commendable policies and the Bureau's realization of the importance of general practice residencies particularly, in order to develop general practice clinicians, the opportunities in the Medical Corps for scientific training, postgraduate study, and professional recognition are legion. Today, there should be no desire (and certainly no excuse) for a young medical officer to waste his professional substance by simply standing by. The science of medicine is moving ahead so rapidly that the physician must accommodate his thinking to modern, scientific concepts of diagnosis and treatment, or else fall by the wayside and be replaced by men of greater intellectual capacity and motivation.

Intellectual capacity, however, is a habit of mind and not an exclusive attribute of youth. Wide horizons in the arts or the sciences derive from disciplined imagination, to which there is no age limit nor mental barrier.

In short, the sky is the limit as far as intellectual challenge, vast scientific horizons, and professional achievement in the Navy are concerned. That the Medical Corps has taken official cognizance thereof is demonstrated by the extensive training program of medical officers now under way. Such vistas lie ahead for those of proved ability or future promise who plan to make a career in the Medical Corps of the United States Navy.

On the more mundane side of the ledger, there are many privileges and benefits of a career in naval medicine which are worthy of enumeration. Some are so obvious that they are frequently overlooked.

First of all, the salary of a medical officer may appear small or even inadequate under present standards, but it should be remembered that

commensurate remuneration will continue even during the years of financial depression, and that by law a 5 percent increase in base pay is provided every 3 years of active duty until "fogies" of 50 percent accrue. More recently, Congress has authorized a bonus of \$100 per month for each medical officer as an earnest of good will and as means of compensating him for the costs of medical education prior to commission in the Medical Corps.

Furthermore, officers in the Medical Corps, just as officers in any other branch of the Regular Service, are entitled to full retirement benefits in pay and privileges. After 30 years of service, this retirement benefit amounts to 75 percent of the officer's base pay for the rest of his life, computed on the highest permanent rank attained during active duty.

Moreover, the automatic provisions against sickness, accidents, and disability should not be disregarded since they remain effective as long as an officer remains in the Navy, whether active or retired. In the event of death on active duty, the Government underwrites the officer's funeral expenses and provides his widow, or next of kin, a gratuity of 6 months' pay. In addition, the widow is entitled to a small monthly pension for the rest of her life or until she remarries. The cost of adequate health and accident protection in civilian practice is so high as to be almost prohibitive; and there are certain restrictions and limitations in civil insurance placed upon the interpretation of the phrase "Total and permanent disability." At the present writing, retirement benefits for disability incurred in the line of duty are not classified as taxable income. Indeed, there are two Federal statutory provisions relating to military personnel which effect distinct tax savings for this group. The income tax structure is presently favorable to the medical officer on active duty.

In addition he is entitled to medical and surgical Government hospital care for the dependent members of his family.

But let us concentrate, rather, upon the outward and visible signs of benefits and advantages of active duty.

The privilege of purchasing supplies through the commissary will effect considerable cash saving for an officer and members of his family. Most amusements at shore installations are provided free of charge to resident personnel. The pleasant social contacts that are made lead to many firm, enduring, and uplifting friendships. The opportunity for travel for oneself and family cannot be matched in civilian life except at great personal expense. The privilege of duty at foreign shore stations broadens one's horizon and perhaps subconsciously makes one a citizen of the world. At one and the same time, one is not only a physician but also a commissioned representative of the Government of the United States of America.

Fortunate is the physician who has the foresight, the imagination, and the good judgment to avail himself of the many and varied opportunities, privileges, and benefits of such an interesting, stimulating, and productive career. Happy is he who, in constancy of purpose, dedicates his life to the service of his Country as well as to the service of his fellow-man.

—*Capt. Christopher C. Shaw (MC) U. S. N.*



Twenty-fifth Anniversary of Kahn Reaction, 1923-48

The twenty-fifth anniversary of the Kahn reaction was commemorated last year. In 1923, Dr. Reuben L. Kahn announced his test for the detection of syphilis; a test which has been of the utmost value in the diagnosis, treatment, and cure of this disease.

The Kahn test has been standard Navy procedure since 1925. The late Rear Admiral E. R. Stitt, (MC) U. S. N. introduced it because of its dependability and because this test could be carried out in ships at sea or on isolated naval stations.

The high esteem which the Medical Department of the Navy holds for Dr. Reuben Kahn is well expressed in a letter from Admiral Swanson to Dr. Kahn which is reproduced on the opposite page.

ADDRESS YOUR REPLY TO
BUREAU OF MEDICINE AND SURGERY
NAVY DEPARTMENT, WASHINGTON 25, D. C.
AND REFER TO

P15/EN

15 December 1948



WASHINGTON 25, D. C.



Dr. Reuben L. Kahn,
University Hospital,
University of Michigan,
Ann Arbor, Michigan.

My dear Doctor Kahn:

Our mutual friend, Admiral Harold W. Smith, very thoughtfully sent me a reprint from the October 1948 issue of the Journal of the Michigan State Medical Society. As I read the articles describing your brilliant work over the past quarter of a century, I was reminded again of the truly great service you have rendered to your colleagues in medical science and to all mankind. It would have been a real personal loss if I had missed the opportunity of seeing this appropriate tribute to you.

At this writing it is but a few days short of twenty-three years since your serological test was made the U.S. Navy standard procedure for the detection of syphilis. No one could even estimate the full significance of this application of your research, but it most certainly stands as one of the great individual contributions to medical science. The Kahn Test has influenced the approach to the detection and control of syphilis in a way which will long endure as a tribute to your devotion to your field of service.

The Navy is honored to have the advantage of your services as Consultant in Serology at the U. S. Naval Medical School, Bethesda, Maryland. The members of the Medical Department of the Navy throughout the world, salute you as a distinguished scientist and fellow worker, on this twenty-fifth anniversary of the announcement of the Kahn Reaction.

Sincerely,

A handwritten signature in cursive script, reading "C. A. Swanson".

C. A. Swanson
Rear Admiral, MC, USN
Chief of Bureau

OFFICERS OF THE MEDICAL DEPARTMENT

*Whose Deaths Have Been Reported Since
the Last Issue of the Bulletin*

BAILEY, JAMES ROBERT, Commander (DC) U. S. N. R. (Inactive). Died 12 January 1949 at Kentucky Baptist Hospital, Louisville, Ky.

BASCOM, FRANCIS SENTER, Lieutenant Commander (MC)S U. S. N. R. (Inactive). Died 23 December 1948 at Piedmont, Calif.

CUMMINS, GUY EUGENE, Lieutenant, junior grade (DC) U. S. N. R. (Inactive). Died 9 October 1948 at Waco, Tex.

DYE, FRANK GANES, Commander (MC) U. S. N. R. (Retired, Inactive). Died 5 January 1947 at Crouse Irving Hospital, Syracuse, N. Y.

GILLILAND, OLIVER MEDLAR, Lieutenant, junior grade (MC) U. S. N. R. (Inactive). Died 25 April 1948 at Rochester, Mich.

GILLS, WILLIAM ARMISTEAD, Lieutenant (MC) U. S. N. (Retired, Inactive). Died 23 November 1948 at Norfolk, Va.

GRILLO, ANGELO SALVATORE, Lieutenant (DC) U. S. N. R. (Inactive). Died 8 December 1946 at Gary, Ind.

JONES, CARL POWER, Lieutenant Commander (MC) U. S. N. R. (Honorary Retired). Died 18 October 1944 at Grass Valley, Calif.

KIRKHAM, HAROLD LAURENS DUNDAS, Captain (MC) U. S. N. R. (Retired, Inactive). Died 18 March 1949.

LAW, LEWIS WAYNE, Lieutenant, junior grade (MC) U. S. N. R. (Inactive). Died 29 August 1945 at Lake Forest, Ill.

NOONAN, EDWARD JOSEPH, Lieutenant (DC) U. S. N. (Retired, Inactive). Died 2 August 1948 at Worcester State Hospital, Worcester, Mass.

RINNE, JOHN "I", Lieutenant Commander (MC) U. S. N. R. (Inactive). Died 9 November 1946.

STEELE, FLEETE SHELTON, Lieutenant Commander (MC) U. S. N. (Retired, Inactive). Died 23 February 1949 at Santa Cruz, Calif.

STRAUB, CHARLES WILLIAM, Lieutenant, junior grade (MC) U. S. N. R. (Active). Died 11 January 1949 at Camp Pendleton, Oceanside, Calif.

WEST, DAVID HICKMAN, Lieutenant Commander (MC) U. S. N. R. (Inactive). Died 15 September 1947 at Woodbury, N. J.

BOOK REVIEWS AND BOOKS RECEIVED



Publishers submitting books for review are requested to address them as follows:

The Editor,

UNITED STATES NAVAL MEDICAL BULLETIN,

Bureau of Medicine and Surgery, Navy Department,
Washington 25, D. C.

(For review)

NOTES: Books marked by symbol ①, ②, or ③ meet the library requirements for personnel training and are recommended by the Advisory Board, Bureau of Medicine and Surgery.

Symbol ① indicates that the book is recommended for naval hospitals; symbol ② for dispensaries, and symbol ③ for dependents service or for medical departments of ships.

A TEXTBOOK OF MEDICINE, edited by Russell L. Cecil, A. B., M. D., Sc. D., *Professor of*
① *Clinical Medicine, Cornell University Medical College; Consulting Physician, New*
② *York and Veterans' Hospitals; Visiting Physician, Bellevue Hospital, New York*
③ *City, with the assistance of Walsh McDermott, M. D., Associate Professor of Medicine, Cornell University Medical College; Associate Editor of Diseases of the Nervous System, and Harold G. Wolff, M. D., Associate Professor of Neurology, Cornell University Medical College.* 7th edition. 1,730 pages; numerous illustrations. W. B. Saunders Co., Philadelphia, Pa., publishers, 1947. Price \$10.

Review previously published.

INTERNAL MEDICINE IN GENERAL PRACTICE, by Robert Pratt McCombs, B. S., M. D.,
① *F. A. C. P., Assistant Professor of Medicine and Director of Postgraduate Teaching,*
② *Tufts College Medical School; Senior Attending Physician, The Joseph H. Pratt*
③ *Diagnostic Hospital; Diplomate of the American Board of Internal Medicine.* 2d edition. 741 pages; numerous illustrations. W. B. Saunders Co., Philadelphia, Pa., publisher, 1947. Price \$8.

Review previously published.

FRACTURES, DISLOCATIONS AND SPRAINS, by John Albert Key, B. S., M. D., and H. Earle Conwell, M. D., F. A. C. S. 4th edition, 1,322 pages; fully illustrated with photographs
② and diagrams. C. V. Mosby Company, St. Louis, Mo., publisher, 1946. Price \$12.50.

Review previously published.

SURGICAL TREATMENT OF THE ABDOMEN, prepared under the supervision of Frederic W.
① Bancroft, A. B., M. D., F. A. C. S., *Professor of Clinical Surgery, New York Medical*
② *College; and Preston A. Wade, A. B., M. D., F. A. C. S., Associate Professor of*
③ *Clinical Surgery, Cornell University Medical College; Associate Attending Surgeon, New York Hospital; Attending Surgeon, New York City Hospital.* 1,100 pages, 457 illustrations, 4 in color. J. B. Lippincott Company, Philadelphia, Pa., publishers, 1948. Price \$18.

This book contains, in addition to the extensive section on surgery of the abdomen, sections on anesthesia, general principles of treatment, and surgery of the mouth and esophagus.

The original volume of operative surgery was published in 1941. This recent edition brings the treatise up to date. Thirty-six contributors, all outstanding specialists in their field, have presented a masterpiece of surgical treatment ably edited by Frederic W. Bancroft.

The section on anesthesia is complete and is accompanied by excellent black and white illustrations. Those illustrating regional anesthesia by Harry S. Ruth are exceptionally well done.

Section 2 under the heading of General Principles covers a variety of subjects in pre- and post-operative treatment and includes the modern concept of fluid and electrolyte disturbances, acidosis and alkalosis, hypovitaminosis, shock and peripheral circulatory failure. The subject is covered in an outstanding manner.

Section 3. Surgery of the Mouth and the Esophagus, is well-presented and well-illustrated. The chapter on surgery of the esophagus by Dr. John H. Garlock is unusually fine.

Section 4 is well done and is written jointly by a number of nationally and internationally known surgeons and covers all subjects from abdominal incisions to portacaval anastomosis for the relief of portal hypertension. The fine chapter on surgical therapy and technic in lesions of the stomach and duodenum by Roscoe E. Grahm, is accompanied by excellent illustrations, both in color and black and white. Other fine chapters are: Surgery of the Small Intestine by Allen and Welch; Appendicitis; Its Surgical Treatment, by Ochsner and Barrow; The Colon and Rectum by Rankin and Graham; and Surgery of the Biliary Tract by Whipple.

This is an outstanding book on surgical treatment of the abdomen and is recommended for interns, residents, and the general practitioner.

—Capt. J. B. Logue (MC) U. S. N.

PRACTICAL CLINICAL PSYCHIATRY, by Edward A. Strecker, A. B., A. M., Sc. D., Litt. D., LL. D., M. D., *Professor of Psychiatry, School of Medicine, University of Pennsylvania*; Franklin G. Ebaugh, A. B., M. D., *Professor of Psychiatry, University of Colorado, School of Medicine; Director, Colorado Psychopathic Hospital*; Jack R. Ewalt, M. D., *Professor of Neuro-Psychiatry; Director, Galveston State Psychopathic Hospital, University of Texas Medical Branch, Section on Psychopathologic Problems of Childhood*, by Leo Kanner, M. D., *Associate Professor of Psychiatry, Johns Hopkins University, School of Medicine*. 6th edition. 476 pages. Illustrated. The Blakiston Company, Philadelphia, Pa., publishers, 1947. Price \$5.

Previous editions of this book are well-known to a large segment of the medical profession, regardless of specialty, as well as to trained psychiatrists throughout the country.

Although the general plan of the new sixth edition remains essentially the same, there have been extensive changes, as well as the addition of much valuable material relating to the now proved theories and concepts of modern psychiatry. This added material is centered largely around the psychoneuroses and the lessons learned during World War II.

For simplicity the authors have held to the general plan of a tentative classification of all psychoses into three groups: organic, toxic, and psychogenic (functional) psychoses. The first 300 pages of the book have to do with the disease entities falling in these groups. The remainder of the book dwells with such subjects as the psychoneuroses, psychosomatic medicine, psychopathic personality, traumatic reactions, and reactions of developmental and constitutional defects.

The section of psychopathologic problems of childhood written by Dr. Leo Kanner, plays a large part in making this book an outstanding text and reference. Another outstanding addition to the new edition is the glossary which is brief but relatively complete in important psychiatric terminology.

The section of the psychoneuroses has been greatly revised and enlarged. This was brought about by the ever increasing need of general practitioners and specialists in all fields of medicine for a more thorough indoctrination in psychiatric concepts and by the new observations brought forth by the experiences of the recent war.

For its clarity, its complete coverage, and its direct method of presentation it is highly recommended as a reference. This book is considered an outstanding text for medical students, as well as for general psychiatric orientation in any course of post-graduate training.

—Capt. E. L. Caveny (MC) U. S. N.

EXPERIENCES WITH FOLIC ACID, by Tom D. Spies, M. D., *Associate Professor of Medicine, University of Cincinnati School of Medicine, Director of the Nutrition Clinic, Hillman Hospital, Birmingham, Alabama.* 110 pages, illustrated. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1947. Price \$3.75.

In this little volume the author briefly sums up the observations leading to the discovery that folic acid is a highly effective synthetic chemical compound in the treatment of Addison's pernicious anemia, nutritional macrocytic anemias of pregnancy, and pellagra.

The results obtained by the author, his coworkers and others in administering folic acids to persons critically ill with the macrocytic anemias were little short of sensational. Observations made on 218 patients, who ranged in age from 18 to 83 years, with the above clinical entities is discussed in detail with the progress of certain cases made vivid by color photographs.

A full chapter is devoted to folic acid therapy in which the various methods of administration are discussed. In the words of Dr. Spies, "Dramatic recovery can be expected when folic acid is given promptly, efficiently, and adequately to properly selected patients."

This is a concise and valuable book that highlights the important facts on "the newest member of the vitamin family," and one which every physician will want to add to his library.

—Capt. H. G. Shepler (MC) U. S. N.

MEDICAL DISORDERS OF THE LOCOMOTOR SYSTEM INCLUDING RHEUMATIC DISEASES, by Ernest Fletcher, M. A., M. D. (Cantab.), M. R. C. P. *Physician to the Arthritis Clinic and Lecturer on the Rheumatic Diseases, Royal Free Hospital; Physician, Queen Mary's Hospital for the East End and the British Red Cross Clinic for Rheumatism; Consulting Physician to the British Legion; Heberden Medallist and Lecturer in Rheumatism; Member of the Research and Scientific Advisory Committees, Empire Rheumatism Council; late Physician-in-Charge of a Medical Division, Emergency Medical Service, Ministry of Health; Consulting Physician to the Kent County Council.* 625 pages; numerous illustrations. The Williams & Wilkins Co., Baltimore, Md., publishers, 1947. Price \$11.

Dr. Fletcher has attempted to include in one volume all the diseases of the locomotor system. Several other authorities have assisted him in this enterprise. The chapter on the classification and incidence of these disorders serves to highlight the difficulty of the subject by emphasizing the fact that so little is known of the rheumatic disorders that comprehensive and complete classification is impossible. The chapter on applied anatomy by G. A. G. Mitchell is a model of conciseness and clarity. Radiology, by F. C. Golding has been limited to the changes found in arthritis, but the remainder of the book has been adequately illustrated to compensate for this fact.

After an adequate discussion of anatomy, and the physiologic and laboratory changes in rheumatism, there is a systematic description of a wide variety of

disorders affecting the locomotor system, particularly rheumatoid arthritis and rheumatic fever. Other chapters are devoted to sciatica, backache, brachial neuralgia, the shoulder joint, and peripheral vascular diseases.

This text is written for orthopedic surgeons and for physicians who have had wide experience with and are primarily interested in locomotor disorders. There is too much detail for the book to be of universal interest. In addition to this, there are so many methods of treatment described that it may be difficult for the inexperienced and uncritical reader to choose the proper and most effective mode of treatment.

—Lt. C. F. Orofino (MC) U. S. N.

MEDULLARY NAILING OF KÜNTSCHER, by Lorenz Böhler, M. D., *Director of the Hospital for Accidents in Vienna; Professor of Surgery at the University of Vienna*. First English edition revised by the author. Translated from the 11th German edition by Hans Tretter, M. D., *Surgeon in Charge of the New Jersey Manufacturers Hospital, Active Consultant in Traumatic Surgery at the Orthopedic Hospital, Trenton, N. J.; former Assistant to Dr. Böhler at the Hospital for Accidents in Vienna; former Demonstrator of Anatomy, University of Graz, Austria*. 386 pages, illustrated. The Williams & Wilkins Company, Baltimore, Md., publishers, 1948. Price \$7.

The publication of a book on medullary nailing of fractures was awaited with considerable interest. Lorenz Böhler is eminently qualified to write such a book.

The first part of the book is concerned with general considerations in the use of the medullary nail, the indications and contra-indications, the effects upon formation of callus, and the apparatus necessary for this procedure.

The second part describes in minute detail the technique used. As each bone to be nailed is taken up separately, the indications and contra-indications are repeated in each section.

Many references in this book are contained in Böhler's "Treatment of Fractures."

The book is abundantly illustrated, but for the most part the illustrations do not follow the text, making it difficult to correlate the text with the illustrations.

Several recommendations made in earlier German editions have been withdrawn in the present edition. It seems quite likely that some of the recommendations made in the present edition may be changed as the result of further experience.

As with other methods of treatment of fractures, complications may occur, such as shortening, rotation, infection, migration of the nail, delayed callus formation, and breaking of the nail.

In comparing the indications and contra-indications, it would seem that the use of the medullary nail is quite limited and should be used only in selected cases.

The bibliography seems fairly complete for such a new procedure; yet it is valueless unless one has access to a large library, since all references are to foreign publications.

—Capt. C. F. Morrison (MC) U. S. N.

TECHNIQUES AND PROCEDURES OF ANESTHESIA, by John Adriani, M. D., *Director, Department of Anesthesia, Charity Hospital of Louisiana; Clinical Assistant Professor of Surgery (Anesthesiology), Louisiana State University; Assistant Professor of General Anesthesia, Loyola University School of Dentistry, New Orleans*. 404 pages, illustrated. Charles C Thomas, Springfield, Ill., publishers, 1947. Price \$6.

This book, written by one of the outstanding anesthesiologists in the United States, is different from his other texts in that it will be useful to the medical student, the resident, and the now-and-then anesthetist as well as to the specialist in anesthesia.

The book is well-organized and is divided into several sections: General Considerations; Inhalation Anesthesia; Intravascular Anesthesia; Rectal Anesthesia; Regional Anesthesia; and Resuscitation and Inhalation Therapy.

The use of an outline form makes for quick reference, and the index allows each subject to be easily located. Included in each section is a list of comments concerning the particular subject under discussion, and opposite each comment is stated the reason why it is of importance.

One of the book's most valuable chapters is that on regional anesthesia. Here all of the more commonly used nerve blocks are described. This should prove particularly useful to those who do only an occasional nerve block.

All types of equipment and drugs currently in use are adequately covered. The references at the end of the sections allow the reader to pursue the subjects further if he so desires.

Perhaps the finest chapter is the one on inhalation anesthesia. Drugs, equipment, techniques, and advantages and disadvantages are all discussed. The finer points of endotracheal anesthesia are described and illustrated in such a way as to be of real value to those who have not had special training in intubating the trachea.

This book should be a worthwhile addition to any hospital library. Its primary usefulness is not as a text but as a reference work.—*B. H. Pender, M. D.*

CLINICAL METHODS OF NEURO-OPHTHALMOLOGIC EXAMINATION, by Alfred Kestenbaum, M. D.,
 ① *Assistant Clinical Professor of Ophthalmology, New York University; Lecturer in Ophthalmology, Mt. Sinai Hospital; Associate Ophthalmologist, City Hospital; Consultant Ophthalmologist, Psychiatric Department, Bellevue Hospital, and Neurologic Department, Goldwater Memorial Hospital.* 384 pages. Grune & Stratton, New York, N. Y., publishers, 1946. Price \$6.75.

This book is a first edition. It is designed as a guide for ophthalmologists and neurologists in conducting and interpreting neuro-ophthalmologic studies, emphasis being placed on clinical methods and differential diagnosis. The author has organized the subject material in a logical and orderly manner. His presentation is in outline form showing well-defined headings with an adequate but concise discussion under each heading. He discusses several points of view on controversial subjects, at the same time indicating his own preference. This is accomplished without the loss of clarity. Illustrations, however, are few in number and do not add appreciably to the presentation of the text. The opening chapters deal with the anatomy, function, and diagnostic examination of the optic pathway. Then chapters on the extraocular paralyses, gaze palsies, nystagmus, and disturbances in symmetrical eye movements follow in order. The concluding chapters deal with the pupil, palpebral fissure, and functional disorders.

At the end of the book, the author has judiciously added an outline for a routine neuro-ophthalmologic examination and a very helpful glossary. The book is well indexed and contains a complete bibliography.

The section on nystagmus is considered outstanding and represents one of the finest presentations on this subject ever published. The author has used excellent judgment in choosing and limiting the subject matter. The field of neuro-ophthalmology is exhaustively covered without the addition of unnecessary material from the field of either ophthalmology or neurology. The book accomplishes the goal set by the author, "to present a review of the clinical method of ophthalmologic examination that may be helpful in neurologic differential diagnosis."

—*Capt. F. Harbert (MC) U. S. N.*—*Commander G. L. Tabor, Jr. (MC) U. S. N.*

DISEASES OF THE SKIN, For Practitioners and Students, by George Clinton Andrews, A. B.

- ① M. D., *Associate Clinical Professor of Dermatology, the College of Physicians and Surgeons, Columbia University; Chief of Clinic, Department of Dermatology, Vanderbilt Clinic; Chief of Dermatology Clinic, Roosevelt Hospital; Attending Dermatologist to Presbyterian Hospital and Roosevelt Hospital; Consulting Dermatologist and Syphilologist to Tarrytown Hospital, Grasslands Hospital, Valhalla, St. Johns Hospital, Yonkers, Greenwich Hospital, and the Beckman-Downtown Hospital; Fellow of the American Medical Association, of the American College of Physicians, and the New York Academy of Medicine; Member of the American Dermatological Association, The American Radium Society, the New York Dermatological Society, New York Roentgen Society, and the Manhattan Dermatological Society; Member of the Deutsche Dermatologische Gesellschaft and Corresponding Member of Société Française de Dermatologie et de Syphiligraphie.* 3d edition. 937 pages, 931 illustrations. W. B. Saunders Company, Philadelphia, Pa., publishers. 1946. Price \$10.

The present edition published 8 years after the second is so thoroughly revised and re-edited that it is completely current and modern. Even the previous defects, which were all minor, have been deleted. During the years since it first appeared (1930), "Andrews" has not only become a standard text for students but has established high favor as a ready reference for practitioners, dermatologists, and internists. The section on X-ray and radium therapy is particularly readable and authoritative but without overemphasis. A final chapter on Roentgen-ray physics by Baestrup is unique in its conciseness and simplicity. The section dealing with naevi and malignant neoplasms is especially well done and reflects the wide experience of the author in this field.

Andrews uses a familiar and rational grouping of the dermatoses making information readily available without frequent recourse to the index. New conditions are included as well as current concepts of therapy. The histology of the different skin conditions is well covered. The photomicrographs and photographs are excellent and add realistically to the text. Probably the most striking characteristics are the availability of the information, its completeness for a volume of its size, and the readability.

This book is highly recommended for the medical student and the general practitioner.

—Capt. R. L. Gilman (MC) U. S. N.

PSYCHOBIOLOGY AND PSYCHIATRY, A Textbook of Normal and Abnormal Human Behavior

- ① by Wendell Muncie, M. D., *Associate Professor of Psychiatry, Johns Hopkins University; Assistant Psychiatrist, Henry Phipps Psychiatric Clinic, Johns Hopkins Hospital.* With a foreword by Adolf Meyer, M. D., LL. D., Sc. D., *Henry Phipps Professor of Psychiatry and Director of the Department of Psychiatry, Johns Hopkins University.* 2d edition. 620 pages, 70 illustrations. The C. V. Mosby Company, St. Louis, Mo., publisher, 1948. Price \$9.

For the past 35 years Dr. Adolf Meyer and his disciples at the Johns Hopkins Hospital have been practicing and teaching a pragmatic, eclectic psychiatry based on a thorough understanding of psychobiology—"the study of those functions distinctively human, the thing man is best known for, the mentally integrated performances." From the viewpoint of this reviewer, it has seemed unfortunate that the special vocabulary developed by this school served to alienate the young trainee in psychiatry working elsewhere than at Johns Hopkins and has obscured from him the great value of the group's teachings. This has evidently been recognized and in this second edition, Dr. Wendell Muncie utilizes the new terminology rarely and then in parentheses.

Following a brief historical and philosophical discussion of psychobiology the author presents a marked departure from other standard basic textbooks in psychiatry. The reader and student is directed through a study of a specific personality, preferably himself, in as objective a manner as possible and then compares similar studies on several other most dissimilar persons. In the course of this pursuit one learns the basic psychological functions and the roles of the

various forces impinging upon a developing personality. The author's discussion of the various theoretical considerations, the myriad schools of thought and many scientific studies bearing on this subject give ample evidence of the "healthy eclecticism" which permeates the entire presentation of psychobiology. An adequate bibliography at the end of each chapter further enforces this attitude.

The rest of the book covers the technique of psychiatric examination: a discussion of the usual clinical entities, the static constitutional types, the psychodynamic minor reactions and the major reactions, and a short comprehensive section on therapy. It is profusely illustrated with "life charts."

Dr. Muncie has an excellent, lucid, readable style and presents his thesis in a most convincing manner. His method of approach has not been emphasized in the several psychiatric teaching centers to which the reviewer has been exposed, and the reading of this book has proved most instructive and interesting. It should be read by all trainees in psychiatry and the discussion of psychobiology should be required reading of all medical students.

—Commander F. H. Ocko (MC) U. S. N.

PHYSICAL FITNESS APPRAISAL AND GUIDANCE, by Thomas Kirk Cureton, Jr., M. A., M. P. E., Ph. D., *Professor of Physical Education and Director of the Physical Fitness Research Laboratory of the University of Illinois, at Urbana*, assisted by Frederick W. Kasch, B. S., M. S., *Director of Physical Education at the Colleges of Medicine, Dentistry, and Pharmacy of the University of Illinois, at Chicago*, John Brown, B. S., *Assistant Director of Physical Education, Colleges of Medicine, Dentistry, and Pharmacy*, and W. G. Moss, M. S., Ph. D., *Instructor in Physiology, College of Medicine, University of Illinois, at Chicago*. 566 pages, illustrated. The C. V. Mosby Company, St. Louis, Mo., publishers, 1947. Price \$6.

The authors' purpose in writing this book was to produce a professional textbook on physical fitness for use in the health and physical education fields.

An attempt is made to define what physical fitness is and to interpret its meaning. The search for tests of physical fitness and an evaluation of such tests to determine those that may be the best and the interrelationship of all the various factors and circumstances is given an extensive detailed discussion. Physique and its appraisal is interpreted and illustrated by photographic cuts of actual individuals and body types in a lengthy, instructive manner so that comparisons of the types are possible on the same page. Many tables and measurements are given. An analysis of weight and means of reducing or increasing it, with the rational of dieting and exercising properly to attain the end in view, is interesting.

The relationship of cardiovascular, respiratory, and motor fitness determinations to the results sought is thoroughly examined and tests described and evaluated.

There is a great deal of the detailed matter which a subject of this kind requires. Medical practitioners may well study this book in connection with not only physical examinations but also, they will find food for thought, in applying appropriate treatment and corrective measures for conditions which all too frequently fall into the hands of operators outside the medical profession.

Under the chapter heading of analysis and prediction of all-out athletic performance, there is a detailed examination and discussion of endurance factors and physiological and body chemistry, etc., which is based on experimental as well as actual athletic performance and which will contribute much to the readers' understanding and interpretation.

The book is recommended to general practitioners, specialists, orthopedists, and those engaged in physical training and education.

—Capt. W. E. Eaton (MC) U. S. N.

VIRAL AND RICKETTSIAL INFECTIONS OF MAN, edited by Thomas M. Rivers, M. D., *Director of the Hospital, The Rockefeller Institute for Medical Research*, with the collaboration of a group of 26 distinguished authorities. 587 pages, 77 illustrations including 6 plates in color. J. B. Lippincott Company, Philadelphia, Pa., publishers, 1948. Price \$5.

This comprehensive volume written by 26 contributors and edited by Dr. Thomas M. Rivers fills the need of a book to collate the knowledge gained so rapidly in recent years of viral and rickettsial diseases. Various units of the book were written by authorities in their respective fields and include sections on the diagnosis, treatment, prognosis, epidemiology, and control measures of the various diseases.

The first third of the volume is devoted to chapters on the nature of viruses and rickettsiae, as well as pathology, epidemiology, purification procedures, serology and identification methods, and chick-embryo techniques. These chapters are complete and contain much of practical value to the worker in these fields.

The remainder of the volume is devoted to consideration of the specific agents and their respective disease entities. Each section is comprehensive, well documented and contains much of value to the clinician. There has been much effort devoted to correlating the knowledge in these rapidly progressing fields.

This book is of interest to the military physician since it covers all viral and rickettsial infections of man including tropical diseases and diseases of animals that may be transmitted to man.

This volume is recommended for use by epidemiological and research units as well as in the naval hospitals.—*Commander P. F. Dickens, Jr., (MC) U. S. N.*

PLASTER OF PARIS TECHNIC, by Edwin O. Geckeler, M. D., *Fellow of the American College of Surgeons, Fellow of the American Academy of Orthopaedic Surgeons, Fellow of the American Association for the Surgery of Trauma, and Diplomate of the American Board of Orthopaedic Surgery*. 2d edition. 220 pages, illustrated. The Williams & Wilkins Company, Baltimore, Md., publishers, 1948. Price \$3.

This is the second edition of a popular monograph. It is fundamentally sound and its usefulness to the neophyte and to the surgeon who only occasionally applies casts is attested by the need for a revised second edition. The format of the original has been maintained but some new illustrations have been added. The clarity and expressiveness of all the illustrations supports its value as a guide in the actual application of plaster for the fixation of extremities.

Plaster application, like other forms of surgery, requires intense precept and practice, but this volume is a sufficiently basic text for the intern, beginning resident, and the orthopedic technician. It should be in the plaster room of every hospital.

Dr. Geckeler demonstrates a simple and practical method of applying plaster fixation for each usual need. There are other satisfactory methods and each expert has his favorites. The ones given here are satisfactory and acceptable. Many "tips" on cast care, trimming, removing, and on plaster reproductions are added.

—*Commander C. R. Carr (MC) U. S. N.*

PULMONARY TUBERCULOSIS AND ITS TREATMENT, by Hans Jacob Ustvedt, M. D., *Oslo, Chief Physician to the Ullersaal Municipal Hospital, IX Department (internal medicine) Oslo. Lecturer on internal medicine and tuberculosis*. Translated by A. L. Jacobs, M. R. C. P. 252 pages, illustrated with 45 plates in black and white, and color. Published by Staples Press Limited, London, 1947. Price 25 shillings.

The book has a great deal of fundamental information, in fact, more information than students and general practitioners (for whom the book is intended)

need. The style is extremely clear, and the reading is always easy and understandable. The material presented represents current Scandinavian opinion on pulmonary tuberculosis.

The author begins with the diagnosis and the development of the tuberculous infection. He carries this logically through to the progressive types of tuberculosis, and finally concludes with a discussion on the treatment and prophylaxis of the disease.

Throughout the first part of the book, the tuberculin test is stressed as a diagnostic agent. In keeping with new ideas the reading of the tuberculin test at 72 hours is advocated. The author points out that in Norway all persons over the age of 40 react to tuberculin for they all have been infected by tuberculosis. The incidence of infection in early life has been found to have diminished from that of several years ago. From this the author concludes that the control methods must be effective, but that it will take several decades to determine the effectiveness for the older age groups.

There are many good descriptions and illustrations of the radiographic findings of tuberculosis. The importance of erythema nodosum to tuberculosis is discussed in great detail. This is a reportable disease in Norway.

The introduction of a single tubercle bacillus into a pulmonary alveolus in a noninfected person invariably results in infection. Dr. Ustvedt does not believe that massive doses of tubercle bacilli are necessary to produce infection. Also it is his opinion that the clinical forms of tuberculosis can arise after long periods of latency after a primary type of infection. It is recommended by him that periodic examinations be made of all tuberculin reactors.

Concerning the discussion on treatment the author is quite sound and clear; however there are several aspects that have not been fully developed. For example bed rest is treated rather cursorily and no account is made of the modern ideas and the pros and cons and the exact definition of bed rest. Likewise, the author has made light of pneumoperitoneum, makes no mention of streptomycin, and discusses forms of therapy that have been abandoned in this country.

The general case-finding survey, preventing tuberculous infections, and the problems of social, economic, hygienic, and dietary factors in the prevention of tuberculosis are discussed. BCG vaccination is recommended and the various Scandinavian series are quoted as proof of its effectiveness in the lowering of the morbidity and the mortality from pulmonary tuberculosis. BCG vaccination is strongly recommended for non-infected family contacts. The book is recommended for students and practitioners for profitable reading.

—*Commander H. A. Lyons (MC) U. S. N.*

OCCUPATIONAL PAMPHLETS—and annotated bibliography. Gertrude Forrester, Ed. D., *Head Counselor, West Side High School, Newark Public Schools, N. J. Instructor, Summer Sessions, Teachers College, Columbia University.* A revised and enlarged edition of *Occupations: A Selected List of Pamphlets*. The H. W. Wilson Company, New York, 1948. Price \$2.50.

This is an annotated list of 2,400 pamphlets arranged alphabetically by profession. The titles conform to the Dictionary of Titles of the U. S. Employment Service and the Dictionary code number is printed after each title. The annotations indicate the information contained in each pamphlet. The publisher, price, and other pertinent data are also included.

A special list of pamphlets includes information regarding job description, apprenticeships, choosing a career, occupations for the handicapped, and how to find a job.

This book contains excellent source material for the vocational counselor.

CLINICAL ROENTGENOLOGY OF THE DIGESTIVE TRACT, by Maurice Feldman, M. D., *Assistant Professor of Gastroenterology, University of Maryland, Associate in Gastroenterology, Mercy Hospital, Consulting Roentgenologist, Sinai Hospital.* 3d edition. 901 pages, illustrated. The Williams & Wilkins Company, Baltimore, Md., publishers, 1948. Price \$8.

This extremely well-illustrated book covers the roentgen diagnosis of lesions of the digestive tract. The anatomy and normal anatomical variations of the gastro-intestinal tract, including the liver and pancreas, are described well. The clinical disorders affecting the various sections of the gastro-intestinal tract are discussed under the various headings including symptoms, causes, types, roentgen signs, and differential diagnosis. A large part of the book is devoted to the roentgen diagnosis of clinical conditions of the duodenum and colon, and also roentgen study of the gallbladder and the appendix are discussed. There are brief discussions in a chapter devoted to roentgenologic findings in diseases of the omentum, mesentery, retroperitoneal neoplastic diseases, lymphomatous diseases, the abdominal vessels, and spleen. In addition there is a chapter on the relation of the deficiency diseases to the gastro-intestinal tract.

The numerous illustrations and the diagrams serve as a practical method of presenting this interesting subject, and the hints on roentgenologic technique make this a valuable book not only for the gastro-enterologist and the roentgenologist, but also for the internist and general practitioner.

—Commander C. D. Burroughs (MC) U. S. N.

BOOKS RECEIVED

Receipt of the following books is acknowledged. As far as practicable, these will be reviewed at a later date.

TECHNIQUE OF TREATMENT FOR THE CEREBRAL PALSY CHILD, by Paula F. Egel, *Cerebral Palsy Director, Children's Hospital, Buffalo, N. Y.*; introduction by Winthrop M. Phelps, M. D., *Medical Director, Children's Rehabilitation Institute, Baltimore, Md.*; appendix by Moir P. Tanner, F. A. C. H. A., *Superintendent, Children's Hospital, Buffalo, N. Y.*, 203 pages, illustrated with photographs and drawings. The C. V. Mosby Company, St. Louis, Mo., publishers, 1948. Price \$3.50.

PRACTICE OF ALLERGY, by Warren T. Vaughan, M. D., *Richmond, Va.* 2d edition, revised by J. Harvey Black, M. D., *Dallas, Tex.* 1,132 pages, illustrated. The C. V. Mosby Company, St. Louis, Mo., publishers, 1948. Price \$15.

VIRUS DISEASES OF MAN, by C. E. Van Rooyen, M. D., D. Sc., (Edin.), M. R. C. P. (Lond.), *Research Member and Professor of Virus Infections, Connaught Medical Research Laboratories and School of Hygiene, University of Toronto, Formerly Sir Hallett Stewart Research Fellow, and Lecturer in Bacteriology, University of Edinburgh.* and A. J. Rhodes, M. D., F. R. C. P., (Edin.), *Research Associate and Associate Professor of Virus Infections, Connaught Medical Research Laboratories and School of Hygiene, University of Toronto, Consultant in Virus Infections, Hospital for Sick Children, Toronto; formerly Lecturer in Bacteriology, University of Edinburgh, and London School of Hygiene and Tropical Medicine, University of London.* 1,202 pages, illustrated. Thomas Nelson & Sons, New York, N. Y., publishers, 1948. Price \$22.50.

TECHNIC OF MEDICATION, by Austin Smith, M. D., C. M., M. Sc., *Director of the Division of Therapy and Research; Secretary, The Council on Pharmacy and Chemistry, The American Medical Association.* 255 pages. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1948. Price \$4.

THE 1947 YEAR BOOK OF ENDOCRINOLOGY, METABOLISM AND NUTRITION, *Endocrinology* edited by Willard O. Thompson, M. D., *Clinical Professor of Medicine, University of Illinois College of Medicine; Attending Physician (Senior Staff), Henrotin Hospital; Attending Physician, Grant Hospital of Chicago.* *Metabolism and Nutrition* edited by Tom D. Spies, M. D., *Chairman, Department of Nutrition and Metabolism, Northwestern University School of Medicine; Director, Nutrition Clinic, Hillman Hospital, Birmingham, Ala.* 575 pages, illustrated. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1948. Price \$3.75.

- THE 1947 YEAR BOOK OF NEUROLOGY, PSYCHIATRY, AND NEUROSURGERY**, Neurology edited by Hans H. Reese, M. D., *Professor of Neurology and Psychiatry, University of Wisconsin Medical School*; and Mabel G. Masten, M. D., *Associate Professor of Neuropsychiatry, University of Wisconsin Medical School*. Psychiatry edited by Nolan D. C. Lewis, M. D., *Director, New York State Psychiatric Institute and Hospital*; *Professor of Psychiatry, Columbia University*. Neurosurgery edited by Percival Bailey, M. D., *Professor of Neurology and Neurological Surgery, University of Illinois*. 702 pages, illustrated. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1948. Price \$3.75.
- HOW LAYMEN CUT MEDICAL COSTS**, by Public Health Institute, Chicago. 85 pages; illustrated. The Lakeside Press, R. R. Donnelley & Sons Company, Chicago, Ill., publishers, 1948. Price Free.
- RADIUM DOSAGE, The Manchester System**, compiled from articles by Ralston Paterson, M. D., F. R. C. S., F. F. R.; H. M. Parker, M. Sc., F. Inst. P.; F. W. Spiers, Ph. D., M. C. Tod, F. R. C. S., F. F. R.; S. K. Stephenson, B. Sc. Tech., and W. J. Meredith, M. Sc., F. Inst. P., Edited by W. J. Meredith, M. Sc., F. Inst. P., *Christie Hospital and Holt Radium Institute, Manchester*. 124 pages. The Williams & Wilkins Company, Baltimore, Md., publishers, 1947. Price \$4.50.
- TREATMENT OF HEART DISEASE**, by William A. Brams, M. S., M. D., Ph. D., *Associate Professor of Medicine, Northwestern University Medical School, and Attending Physician, Michael Reese Hospital, Chicago*. 195 pages; illustrated. W. B. Saunders Company, Philadelphia, Pa., publishers, 1948. Price \$3.50.
- CORRELATIVE NEUROANATOMY**, by Joseph J. McDonald, M. S., M. Sc. D., M. D., Joseph G. Chusid, A. B., M. D., and Jack Lange, M. S., M. D. 4th edition, revised. 156 pages; with 60 illustrations. University Medical Publishers, Palo Alto, Calif., publishers, 1947. Price \$3.
- NEW AND NONOFFICIAL REMEDIES, 1948**. Containing descriptions of the articles which stand accepted by the Council on Pharmacy and Chemistry of the American Medical Association on June 15, 1948. Issued under the direction and supervision of the Council on Pharmacy and Chemistry of the American Medical Association. 800 pages. J. B. Lippincott Company, Philadelphia, Pa., publishers, 1948. Price \$3.
- THE RH BLOOD GROUPS AND THEIR CLINICAL EFFECTS**, Privy Council Medical Research Council Memorandum No. 19, by P. L. Mollison, A. E. Mourant, and R. R. Race. 74 pages, illustrated. His Majesty's Stationery Office, London, publishers, 1948. Price 1s. 6d.
- TREATISE ON SURGICAL INFECTIONS**, by Frank Lamont Meleney, M. D., *Associate Professor of Clinical Surgery, College of Physicians and Surgeons, Columbia University, Associate Visiting Surgeon, Presbyterian Hospital, New York*. 713 pages; illustrated. Oxford University Press, New York, N. Y., publishers, 1948. Price \$12.
- THE THYROID, AND ITS DISEASES**, by J. H. Means, M. D., *Jackson Professor of Clinical Medicine, Harvard University, and Chief of the Medical Services, Massachusetts General Hospital*. From the Thyroid Clinic of the Massachusetts General Hospital. 2d edition. 571 pages, illustrated, with chapters on Pathology and the Tumors of the Thyroid, by R. W. Rawson, M. D., *Assistant Professor of Medicine, Harvard University, and Associate Physician, Massachusetts General Hospital*, and on Surgery of the Thyroid, by Oliver Cope, M. D., *Assistant Professor of Surgery, Harvard University, and Visiting Surgeon, Massachusetts General Hospital*. J. B. Lippincott Company, Philadelphia, Pa., publishers, 1948. Price \$12.
- UROLOGY FOR NURSES**, by Oswald Swinney Lowsley, M. D., F. A. C. S., *Director of the Department of Urology (James Buchanan Brady Foundation) of the New York Hospital; Consulting Urologist, St. Clare's Hospital and Hospital for the Ruptured and Crippled, New York City; Monmouth Memorial Hospital, Long Branch, N. J.; Englewood Hospital, N. J.; St. Luke's Hospital, Newburgh, N. Y.; St. Agnes Hospital, White Plains, N. Y.; Norwalk Hospital, Conn., and Thomas Joseph Kirwin, M. D., F. A. C. S., Attending Surgeon, Department of Urology (James Buchanan Brady Foundation) of the New York Hospital; Visiting Genito-Urinary Surgeon, New York City Hospital; Consulting Urologist, Coney Island Hospital; Monmouth Memorial Hospital, Long Branch, N. J.; Benedictine Hospital, Kingston, N. Y.; St. Vincent's Hospital, Montclair, N. J.* 2d edition, 687 pages, illustrated. The J. B. Lippincott Company, Philadelphia, Pa., publishers, 1948. Price \$6.

- A-B-C'S OF SULFONAMIDE AND ANTIBIOTIC THERAPY**, by Perrin H. Long, *Professor of Preventive Medicine, The Johns Hopkins University School of Medicine; Physician, The Johns Hopkins Hospital*. 231 pages. W. B. Saunders Company, Philadelphia, Pa., publishers, 1948. Price \$3.50.
- PEDIATRIC ANESTHESIA**, by M. Digby Leigh, M. D., *Director of Anesthesia, Vancouver Hospital, Vancouver, Canada; Diplomat of the American Board of Anesthesiology; Formerly Director of Anesthesia, Children's Memorial Hospital, Montreal, Canada; Formerly Assistant Professor of Anesthesia, McGill University, Montreal, Canada;* and M. Kathleen Belton, M. D., *Supervisor of Pediatric Anesthesia, Vancouver General Hospital, Vancouver, Canada; Formerly Assistant Director of Anesthesia, Children's Memorial Hospital, Montreal, Canada; Formerly Demonstrator in Anesthesia, McGill University, Montreal, Canada*. 240 pages, illustrated. The Macmillan Company, New York, N. Y., 1948, publishers. Price \$5.50.
- KINESIOLOGY, LABORATORY MANUAL**, by Leon G. Kranz, M. S., *Professor of Physical Education and Chairman of the Department, Northwestern University, Evanston, Ill.* 175 pages, illustrated. The C. V. Mosby Company, St. Louis, Mo., publishers, 1948. Price \$2.75.
- ELEMENTARY ANESTHESIA**, by W. N. Kemp, M. D. C. M., *Consultant Anesthetist, Children's Hospital, Vancouver, B. C.* 289 pages, illustrated. Williams & Wilkins Co., Baltimore, Md., publishers, 1948. Price \$5.
- TEXTBOOK OF EMBRYOLOGY**, by Harvey Ernest Jordan, M. A., Ph. D., Sc. D., *Professor of Anatomy and Director of the Anatomical Laboratories, University of Virginia;* and James Ernest Kindred, M. A., Ph. D., *Professor of Anatomy, University of Virginia*. 5th edition. 613 pages, illustrated. D. Appleton-Century Company, Inc., New York, N. Y., publishers, 1948. Price \$7.50.
- INFANT NUTRITION, A Textbook of Infant Feeding for Students and Practitioners of Medicine**, by P. C. Jeans, A. B., M. D., *Professor of Pediatrics, College of Medicine, State University of Iowa, Iowa City;* and Williams McKim Marriott, B. S., M. D., *Late Professor of Pediatrics, Washington University School of Medicine; Physician in Chief, St. Louis Children's Hospital, St. Louis*. 4th edition, 516 pages; illustrated. The C. V. Mosby Company, St. Louis, Mo., publishers, 1947. Price \$6.50.
- A METHOD OF ANATOMY, Descriptive and Deductive**, by J. C. Bolleau Grant, M. C., M. B., Ch. B., F. R. C. S. (Edin.), *Professor of Anatomy in the University of Toronto*. 4th edition 852 pages, illustrated. The Williams & Wilkins Company, Baltimore, Md., publishers, 1948. Price \$7.
- SENSORY MECHANISMS OF THE RETINA, With an Appendix on Electroretinography**, by Ragnar Granit, M. D., *Director of the Nobel Institute for Neurophysiology, Professor of Neurophysiology, The Royal Caroline Institute, Stockholm*. 412 pages, illustrated. Oxford University Press, New York, N. Y., publishers, 1947. Price \$11.
- FRACTURES AND DISLOCATIONS**, by Edwin O. Geckeler, M. D., *Fellow of the American College of Surgeons, Fellow of the American Academy of Orthopaedic Surgeons, Fellow of the American Association for the Surgery of Trauma, and Diplomat of the American Board of Orthopaedic Surgery*. 4th edition. 371 pages, illustrated. The Williams & Wilkins Company, Baltimore, Md., publishers, 1948. Price \$5.
- ESSAYS ON HISTORICAL MEDICINE**, by Bernard J. Ficarra, A. B., Sc. B., M. D., *Professor of Research Biology in charge of Experimental Physiology, St. Francis' College, Brooklyn, N. Y., Diplomat of the American Board of Surgery, Member of American Association of the History of Medicine, New York Society for Medical History, New York Academy of Sciences*. 220 pages; illustrated. Froben Press, Inc., New York, N. Y., publishers, 1948. Price \$5.
- CORONARY HEART DISEASE**, By A. Carlton Ernstene, M. D., *Chief of the Section on Cardiovascular Disease, Cleveland Clinic, Cleveland, Ohio*. 95 pages. Charles C Thomas, Springfield, Ill., publishers, 1948. Price \$2.50.
- CHILDREN'S EYE NURSING**, by James Hamilton Doggart, M. A., M. D. (Cantab.), F. R. C. S., Eng., *Ophthalmic Surgeon, Hospital for Sick Children, Great Ormond Street, London; Surgeon and late Research Scholar, Moorfields Eye Hospital; Ophthalmic Surgeon, St. George's Hospital; Lecturer in Ophthalmology at St. George's Hospital Medical School; Late Senior Open Foundation Scholar, King's College, Cambridge;*

Late Wing-Commander, Royal Air Force Medical Service, Volunteer Reserve. 144 pages, illustrated. Henry Kimpton, London, England, publishers, 1948. Price \$2.25.

THE ACUTE BACTERIAL DISEASES, Their Diagnosis and Treatment, by Harry F. Dowling, M. D., F. A. C. P., *Clinical Professor of Medicine, George Washington University; Chief, George Washington Medical Division, Gallinger Municipal Hospital, with the Collaboration of Lewis K. Sweet, M. D., Chief Medical Officer in Pediatrics and Infectious Diseases, Gallinger Municipal Hospital; Adjunct Clinical Professor of Pediatrics, George Washington and Georgetown Universities; and Harold L. Hirsch, M. D., Assistant Professor of Medicine, Georgetown University; Director of the Bacteriology and Immunology Laboratory, Georgetown University Hospital.* 465 pages; illustrated. W. B. Saunders Company, Philadelphia, Pa., publishers, 1948. Price \$6.50.

PROCEEDINGS: CONFERENCE ON DIAGNOSIS IN STERILITY, Sponsored by the National Committee on Maternal Health, January 26-27, 1945, New York City, edited by Earl T. Engle. 237 pages, illustrated. Charles C Thomas, Springfield, Ill., publishers, 1946. Price \$5.

ALLERGY IN THEORY AND PRACTICE, by Robert A. Cooke, M. D., Sc. D., F. A. C. P., *Attending Physician and Director of the Department of Allergy, the Roosevelt Hospital, New York City, in association with Horace S. Baldwin, Robert Chobot, R. Clark Grove, Joseph Harkavy, Sellan Hebold, Michael Heldelberger, Paul Klemperer, Louis Schwartz, W. C. Spain, Dudley D. Stetson, Albert Vander Veer, Mathew Walzer, and Margaret B. Strauss.* 572 pages, illustrated. W. B. Saunders Company, Philadelphia, Pa., publishers, 1947. Price \$8.

BRITISH SURGICAL PRACTICE, under the General Editorship of Sir Ernest Rock Carling, F. R. C. S., F. R. C. P., *Consulting Surgeon, Westminster Hospital, and J. Paterson Ross, M. S., F. R. C. S., Surgeon and Director of Surgical Clinical Units, St. Bartholomew's Hospital; Professor of Surgery, University of London.* Volumes 1 and 2 of 8 volumes. 561 pages, illustrated. The C. V. Mosby Company, St. Louis, Mo., publishers, 1948. Price \$15.

LIFE IS FOR LIVING, by D. Ewen Cameron, M. D., *Professor of Psychiatry, McGill University; Psychiatrist-in-chief, Royal Victoria Hospital; Director, Allan Memorial Institute of Psychiatry, Formerly Professor of Neurology and Psychiatry, Albany Medical College; Neurologist and Psychiatrist-in-Chief, Albany Hospital.* 241 pages; illustrated. The Macmillan Co., New York, N. Y., publishers, 1948. Price \$2.75.

THE LOUSE, An Account of the Lice Which Infest Man, Their Medical Importance and Control, by Patrick A. Buxton, C. M. G., F. R. S., *Director, Department of Medical Entomology, London School of Hygiene and Tropical Medicine; Professor of Medical Entomology, University of London; formerly Fellow of Trinity College, Cambridge.* 164 pages. The Williams & Wilkins Company, Baltimore, Md., publishers, 1946. Price \$2.70.

MODERN DRUGS IN GENERAL PRACTICE, by Ethel Browning, M. D., Ch. B. 2d edition. 223 pages. The Williams & Wilkins Company, Baltimore, Md., publishers, 1947. Price \$4.

TRACK AND FIELD ATHLETICS, by George T. Bresnahan, *Track Coach and Assistant Professor of Physical Education, University of Iowa, and W. W. Tuttle, Ph. D., Professor of Physiology, University of Iowa.* 2d edition. 498 pages; illustrated. The C. V. Mosby Company, St. Louis, Mo., publishers, 1947. Price \$4.50.

DENTISTRY FOR CHILDREN, by John Charles Brauer, D. D. S., A. B., M. Sc., F. A. C. D., *Director of Post-graduate Dental Education and Professor of Pedodontics, School of Dentistry, University of Washington; L. B. Higley, B. A., D. D. S., F. A. C. D.; Professor and Head of the Department of Orthodontics, School of Dentistry, University of Iowa; Maury Massler, D. D. S., M. S., Director of the Child Research Clinic and Associate Professor of Histology, College of Dentistry, University of Illinois; and Isaac Schour, D. D. S., Ph. D., D. Sc., Professor and Head of the Department of Histology, College of Dentistry, University of Illinois.* 2d edition. 417 pages; illustrated. The Blakiston Company, Philadelphia, Pa., publishers, 1947. Price \$8.50.

WAR, POLITICS, AND INSANITY, by C. S. Bleumel, M. A., M. D., F. A. C. P., M. R. C. S. (Eng.). 121 pages. The World Press Inc., Denver, Colo., publishers, 1948. Price \$2.

TREATMENT BY DIET, by Clifford J. Barborka, B. S., M. S., M. D., D. Sc., F. A. C. P., *Assistant Professor of Medicine, Northwestern University Medical School, Chicago; Attending Physician, Passavant Memorial Hospital; Consultant in Gastro-enterology and Gastroscopy, Diagnostic Center, Hines Veterans Hospital; formerly Consulting Physician, The Mayo Clinic.* 5th edition. 784 pages, illustrated. J. B. Lippincott Company, Philadelphia, Pa., publishers, 1948. Price \$10.

EPILEPSY, Proceedings of the Association Held Jointly with The International League Against Epilepsy, December 13 and 14, 1946. New York. 654 pages, 167 illustrations. The Williams & Wilkins Company, Baltimore, Md., publishers, 1947. Price \$12.

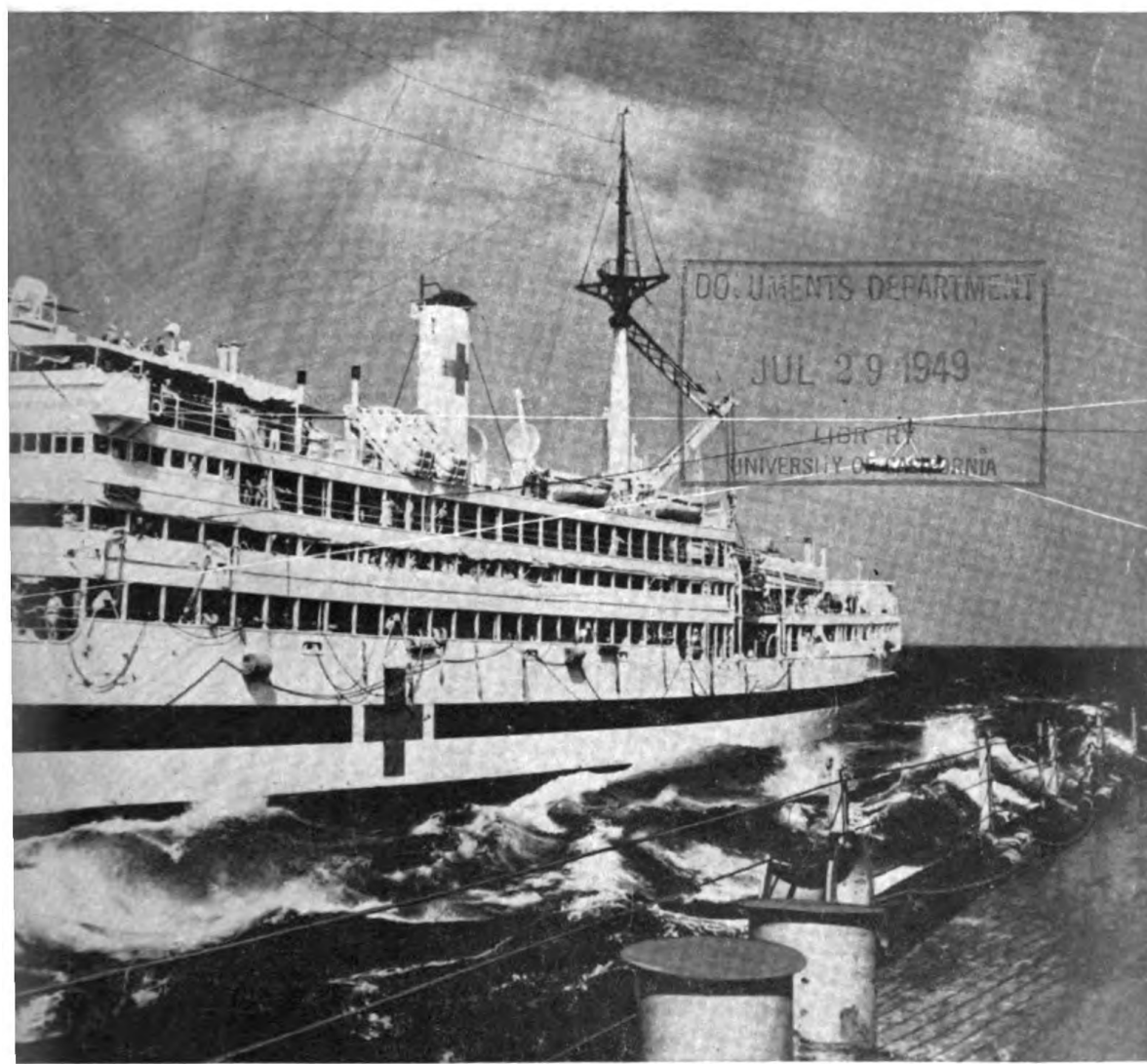


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COVER PHOTOGRAPH

A hospital ship of the United States Pacific Fleet receiving a wounded man from a warship which has pulled up alongside the mercy vessel in a transfer on the high seas.

—Official United States Navy Photograph.

Vol. 49

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UNITED STATES NAVAL MEDICAL BULLETIN

THE MISSION OF THE MEDICAL DEPARTMENT OF THE NAVY
TO KEEP AS MANY MEN AT AS MANY GUNS
AS MANY DAYS AS POSSIBLE



BIMONTHLY

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BUREAU OF MEDICINE AND SURGERY
JOSEPH L. SCHWARTZ, Captain (MC), U. S. N., Editor

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See page ii for prices

NAVY DEPARTMENT,
Washington, March 20, 1907.

THIS UNITED STATES NAVAL MEDICAL BULLETIN is published by direction of the Department for the timely information of the Medical and Hospital Corps of the Navy.

TRUMAN H. NEWBERRY,
Acting Secretary.



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Volume 25, 1927, No. 1.

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PREFACE



The UNITED STATES NAVAL MEDICAL BULLETIN was first issued in April 1907 as a means for supplying Medical Department personnel of the United States Navy with information regarding the advances which are continually being made in the medical sciences, and as a medium for the publication of accounts of special researches, observations, or experiences of individual medical officers.

With the establishment of the Nurse Corps in 1908, the Dental Corps in 1912, and the Medical Service Corps in 1947, the function of the BULLETIN was broadened to serve in a similar capacity for members of those Corps.

It is the aim of the Bureau of Medicine and Surgery to furnish in each issue special articles relating to naval medicine and dentistry, editorial comment on current literature of special professional interest to Medical Department personnel, clinical notes on interesting cases, descriptions of suggested devices, reports from various sources, notes and comments on topics of professional interest, and notices of newly published professional books.

The Bureau extends an invitation to all officers of the Medical Department to prepare and forward, with a view to publication, contributions on subjects of professional interest.

The Bureau does not necessarily undertake to endorse views or opinions which may be expressed in the pages of this publication.

CLIFFORD A. SWANSON,
Surgeon General, United States Navy.

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JOSEPH L. SCHWARTZ, *Editor,*
Captain, Medical Corps,
United States Navy.

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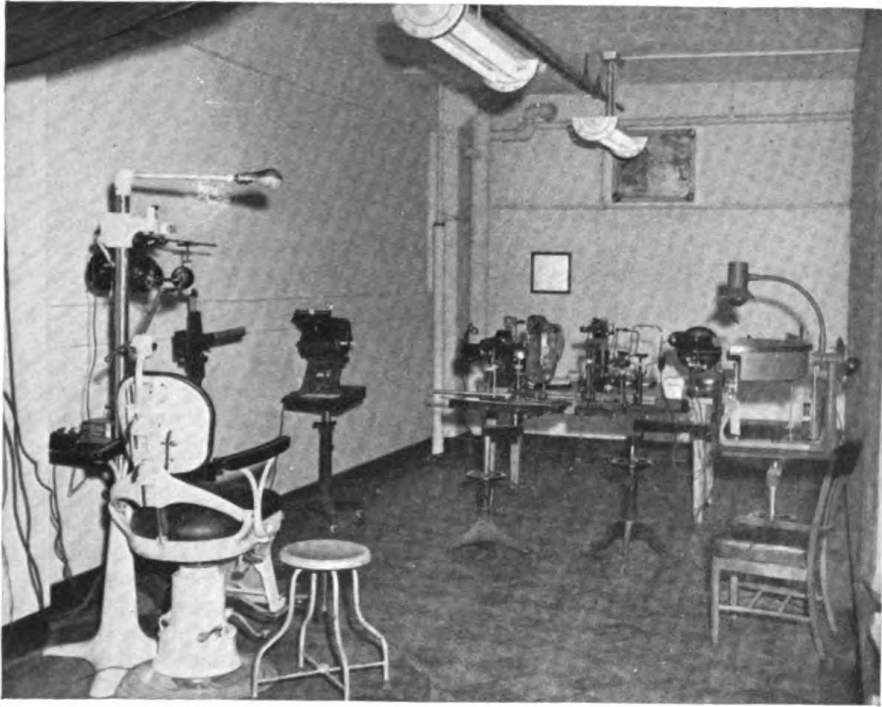
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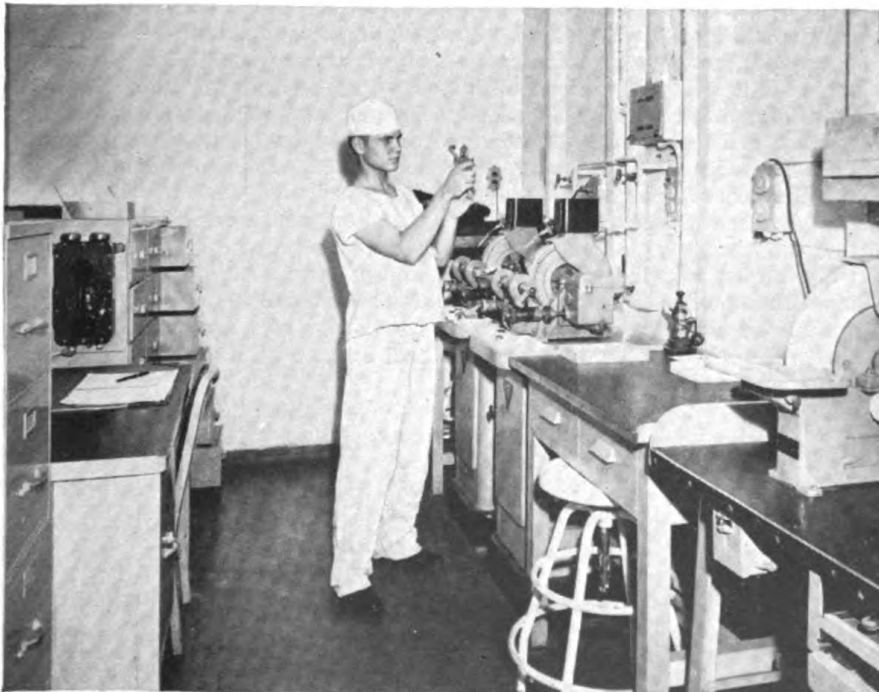
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Optical Dispensing Unit



A typical installation of a U. S. Navy Optical Dispensing Unit.



Portion of ship optical shop.

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20 July 1949



WASHINGTON 25, D. C.

Fellow Officers of the Medical Department:

The Medical Service Corps was established by an Act of Congress in August, 1947. This Act created an Optometry Section, thus providing for the commissioning of graduate optometrists in the Navy and Naval Reserve, in the ranks from Ensign to Captain.

There is a definite need for professional optometric services in the Medical Department. In hospitals, in large dispensaries, in hospital ships, in Naval Training schools and in certain technical and administrative fields the services of optometrists are essential. Complete medical care for Naval Military personnel embraces the contributions of all the professional services which support and supplement the practice of medicine. The increased size of the Navy and the lowering of visual requirements for active duty personnel has created a tremendous demand for more frequent eye examinations in order to help in maintaining personnel at their peak of efficiency.

In addition to his professional duties, the optometrist is directly responsible for the functions of the Optical Service Units and the Optical Dispensing Units. Thirty-two dispensing optical units within the continental limits of the United States furnish spectacles to active duty personnel, and five optical service units fabricate and dispense spectacles to active duty personnel at extra-continental activities. These units dispensed over 30,000 pairs of spectacles and made an equal number of repairs and adjustments during the past year. To this impressive amount of work must be added 50,000 refractions done by the optical services at extra-continental activities.

A recent survey of the optometry and optical services showed that certain activities required expansion of existing optical facilities while others required the installation of an optical department. To meet the optometry need a program has been introduced, which when completed should provide a well-rounded optometry and optical service in keeping with the high professional standards of the Medical Department of the Navy.

Sincerely,

A handwritten signature in dark ink, appearing to read "C. H. Swanson".

Rear Admiral, Medical Corps
Surgeon General, U. S. Navy

U. S. NAVAL MEDICAL BULLETIN

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JULY—AUGUST 1949

No. 4

ARTICLES



Treatment of Pulmonary Tuberculosis

An Evaluation of Present Methods

EDGAR RICE, *Captain (MC) U. S. N.*

CONSIDERABLE variation of opinion still exists among phthisiologists regarding the initial procedure to be followed in treating the newly discovered case of active pulmonary tuberculosis. Each procedure has its proponents who, on the basis of their own experience, prefer one particular method to another.

In our enthusiasm for one method or another, it is wise not to ignore the fact that there is an individual factor which predetermines the success of any method to be selected. This is the genetic factor of inherited resistance or immunity possessed at birth.

Some cases of tuberculosis will become arrested regardless of whether or not the prescribed treatment is adhered to, or for that matter, whether or not they are treated properly. Likewise, in a significantly smaller number the disease will progress despite the most skillful treatment by the physician and the most faithful cooperation of the patient.

We, therefore, should be extremely critical of the results we achieve in treating the former group, for these results may occur in spite of the particular method used and not because of it.

Similarly, when treating patients that fall in the latter group, it is obviously unfair to deprecate a method which has failed to yield the

desired results, since any method selected would have been foredoomed to failure.

Before attempting to evaluate present methods of treating pulmonary tuberculosis, a word must be said about two procedures of fundamental importance to proper diagnosis and treatment of pulmonary tuberculosis.

The first is the examination of the sputum. A sputum or gastric smear and stain is not a completely reliable method of establishing a diagnosis of pulmonary tuberculosis. Morphologically there are at least eight organisms which are almost identical and indistinguishable from *Mycobacterium tuberculosis hominis* as they appear under the high-power microscope. These organisms are: *Mycobacterium tuberculosis avium*; *Myco. piscium*; *Myco. lacticola*; *Myco. phlei*; *Myco. thamnopheos*; *Myco. chelonei*; *Myco. paratuberculosis*; and *Myco. butyricum*.

The only truly reliable method of isolating the specific bacillus of tuberculosis is by cultural methods, using specimens of sputum, gastric wash, and on occasion, bronchial wash, followed by animal inoculation of the culture. The original postulates set forth by Koch for establishing the specific identity of a micro-organism is still the only reliable method of establishing a diagnosis.

A procedure which must be accomplished before initiating any type of treatment (bed rest or collapse therapy) is the endoscopic examination of the tracheobronchial tree. The diagnosis, treatment, and elimination of obstructive endobronchial disease is a fundamental prerequisite to the treatment of pulmonary tuberculosis. The routine bronchoscopic examination of all patients admitted to a tuberculosis service is just as important a routine procedure as the examination of the sputum. The physician who ignores this procedure or the treatment of endobronchial disease once the diagnosis has been established, cannot successfully or intelligently treat pulmonary tuberculosis by any method.

Before embarking on the more controversial subject of collapse therapy, a word must be said on the subject of bed rest. Despite the phenomenal advances in the field of thoracic surgery and antibiotics, bed rest still is and will remain the keystone in our struggle against pulmonary tuberculosis. Bed rest approaching basal conditions as nearly as possible is not only a most potent weapon in itself, but as an adjunct to mechanical collapse therapy is an indispensable part of the treatment. Unfortunately even to the physician, bed rest has many different meanings. Properly speaking, bed rest means bed rest 24 hours a day, every day, in the reclining position, using only one pillow. With this type of treatment tuberculosis can be cured, provid-

ing certain definite indications for more radical therapy do not exist, such as: persistent hemorrhage; thick-walled cavities; extensive endobronchial disease; and recent bronchogenic or hemoptoic spread of disease.

Unfortunately it is not always possible to obtain the patient's cooperation in the matter of bed rest. If, after a fair trial of a rest regimen, the disease is observed to progress, the time has arrived to initiate mechanical collapse therapy. If a regimen of bed rest is persisted in too long in the face of progressive disease, cavities may become too thick-walled or disease too extensive to respond to more conservative treatment such as pneumothorax or pneumoperitoneum. Major thoracic surgery then becomes the only other alternative.

Many workers feel that by initiating collapse therapy immediately without a preliminary trial by bed rest, the disease is brought under control more quickly, the patient becomes rehabilitated sooner and the incidence of recurrence is less. Excellent results have been achieved by both methods. The author's personal preference is to initiate collapse procedure immediately, using bed rest as an adjunct. In this way, it is believed that the physician will more frequently observe the patient's disease regress rather than progress.

Generally speaking, providing the indications for radical thoracic surgery do not exist, it is wiser to initiate the simpler procedure first, progressing to the more radical methods after these have been found inadequate (fig. 1).

To be more specific; when pneumothorax is ineffective or impossible, pneumoperitoneum in conjunction with phrenic nerve paralysis may be substituted. Failing in this procedure, thoracoplasty can then be resorted to; and if thoracoplasty fails, resection becomes available.

The secret of successful therapy lies in abandoning an ineffective collapse procedure as soon as its inadequacy becomes apparent. Failure to do this not only may prolong cure but may make it impossible. Here it might be well to emphasize that, at times, the most radical

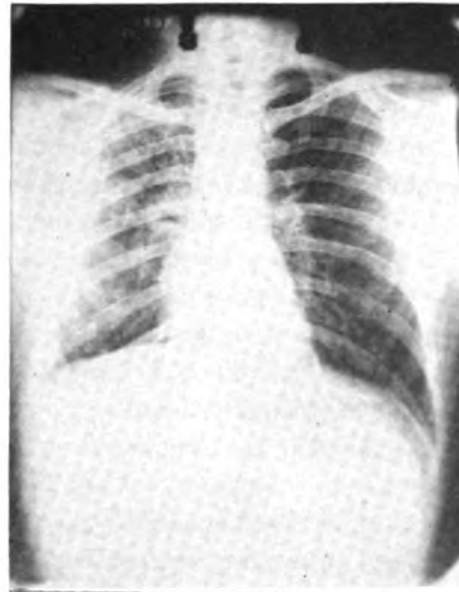


Figure 1.—Scattered exudative type of infiltration involving first and second right anterior interspaces with cavities below clavicle and adjoining right hilar region.

treatment is the most conservative. For example, it may be wiser to proceed with a primary thoracoplasty or lung resection when pneumothorax or pneumoperitonium obviously would be of little value. Sometimes, in considering the serious risks of surgery, we lose sight of the fact that patients also die of tuberculosis.

Ideally the most effective collapse therapy consists of a selective artificial pneumothorax free of complications. Unfortunately this ideal type of collapse is not always possible, due to the complete or partial obliteration of the pleural space or complications developing during the course of treatment which necessitates its abandonment. It is only fair to state, however, that many of the complications attributed to artificial pneumothorax are in fact attributable to its injudicious or improper use. Errors in judgment or faulty administration of pneumothorax have frequently discredited this procedure.

One of the most frequent complications of artificial pneumothorax is the development of pleural effusion. This does not include the small transitory effusions which are sterile and may be considered of little significance. Some workers believe the use of positive intrapleural pressures is of direct etiologic significance in the production of effusions. Cabot Brown has shown that the position of the patient while receiving pneumothorax refills is important in controlling intrapleural pressure. He contends, that, when the patient is lying on his side with a sandbag placed between the iliac crest and the last rib and the arm extended, the volume of the pleural space is increased to such an extent that false negative manometric readings are obtained. Following the administration of pneumothorax, if the patient is placed on his back or abdomen with his hands at his sides, and the intrapleural pressure again tested it will be found to be positive, even though in the previous position negative manometric fluctuations were recorded. This fact has been verified in patients on the tuberculosis service of this hospital.

This, however, is not the whole story. Positive pressure is not solely responsible for the development of effusion. Some workers, in fact, report effusions occurring when negative pressures are used. Other probable factors in the production of pleural effusion will be briefly mentioned: Subpleural tubercles which rupture spontaneously into the pleural space or are traumatized by pneumothorax needles; thoracoscopy for diagnostic purposes or for liberating pleural adhesions; and stretching and rupture of adhesions with the introduction of tubercle bacilli into the pleural space. All play a role. Some authors state that as high as 90 percent of pleural effusions contain tubercle bacilli; verified by cultural methods.

The other complications of artificial pneumothorax are: Empyema; atelectasis; unexpandable lung; bronchopleural fistula; pleural adhesions; obliterative pleuritis; spontaneous pneumothorax; and tension cavity (fig. 2). Many of these complications occur despite the exercise of the best professional judgment and in the hands of the most skilled. Also, from a practical standpoint in this era of rapid transportation, the tuberculous patient frequently travels all over the country taking his refills wherever available and not always from the most competent hands, which fact may be contributory to the frequency of pneumothorax complications.



Figure 3.—Right phrenic nerve paralysis and pneumoperitoneum established following abandonment of pneumothorax. Cavity in right middle lobe adjoining hilar region persists. Interval course of streptomycin produced no alteration in the size of the cavity.



Figure 2.—Roentgenogram taken following artificial pneumothorax. A large tension cavity has developed in the right upper lobe.

The use of pneumoperitoneum with or without inducing phrenic nerve paralysis eliminates the complications of artificial pneumothorax by the simple expedient of staying out of the pleural space. The most enthusiastic adherents of artificial pneumothorax must concede that by staying out of the pleural space the complications of pneumothorax are avoided, although they do not concede the efficacy of pneumoperitoneum as an initial procedure. In addition to avoiding the complications resulting from the introduction of air into the pleural space, pneumoperitoneum has other advantages. It permits serial roentgenographic studies of the lung parenchyma during the course of treatment without the dangers attendant on expansion of the lung—a necessity in pneumothorax in order to eval-

uate the progress of a lesion (fig. 3). Similarly, once the lung is expanded following artificial pneumothorax, and if there is a recurrence of the disease recollapse is not feasible.

The same danger does not exist when pneumoperitoneum is used, since pneumoperitoneum can easily be reestablished. The complications of pneumoperitoneum are infrequent and considerably less serious than those of pneumothorax. Briefly mentioned, they are: Subcutaneous emphysema; shoulder pain; hernia; peritoneal fluid; and obliterative peritonitis. In fairness to the advocates of pneumoperitoneum, it must be stated that in many instances there has been a tendency to use pneumoperitoneum only as a last resort and after other methods have failed or have been found inadequate in controlling pulmonary disease. Despite the unfavorable type of cases in which pneumoperitoneum has been used, the results have often been surprising. When this type of case is replaced by a more favorably selected case, the results are often proportionately better.

Anderson (2) has pointed out that when the pleural space is obliterated by adhesive pleuritis, reduction in pulmonary volume is much more difficult with pneumoperitoneum. A free pleural space permits a greater elevation of the diaphragm and hence greater compression and relaxation of pulmonary tissue.

Unfortunately many of the cases selected for pneumoperitoneum have had a preliminary trial by artificial pneumothorax, only to be abandoned because of loss of pleural space and subsequent progression of disease.

It is therefore apparent that a free pleural space is a considerable asset, although not absolutely essential, for successful pneumoperitoneum. If pneumoperitoneum is used more frequently as an initial procedure, a free pleural space will be more frequently encountered and better end results will be achieved.

Pneumoperitoneum does not cure all cases of pulmonary tuberculosis. Like other collapse procedures it has its indications as well as its limitations. When pneumoperitoneum is ineffective its continued use is injudicious and dangerous just as in the case of artificial pneumothorax. This brings us to the problem of major thoracic surgery in the treatment of pulmonary tuberculosis. Some thoracic surgeons categorically state that neither artificial pneumothorax nor pneumoperitoneum have any curative value; their sole purpose being to prepare the patient for future thoracic surgery. Fortunately this represents an extreme viewpoint. Many patients are alive today as a result of being cured by a more conservative procedure while awaiting major thoracic surgery. It has recently been gratifying to hear an eminent thoracic surgeon state that he is in no disagreement with those who prefer to give more conservative procedures a trial. He

feels that it is the role of the surgeon to correct the mechanical difficulties which are obstacles to more conservative treatment. This represents the more rational viewpoint of the thoracic surgeon.

As previously stated, under certain conditions the most radical treatment is the most conservative. At times a primary resection or thoracoplasty is not only the operation of choice but a lifesaving procedure. The controversy between the adherents of primary thoracoplasty and those of primary resection is not a serious one. Both agree, should thoracoplasty fail, resection is still possible. The vast majority of thoracic surgeons are in agreement that the following conditions are indications for resection rather than thoracoplasty: (a) Lower lobe and middle lobe cavities, and cavities adjoining the hilus of the lung unsuccessfully treated by more conservative methods (fig. 4); (b) tuberculoma; (c) extensive basal disease which has failed to respond to other forms of collapse therapy; (d) ulcerostenotic endobronchial disease; and (e) bronchiectasis.

Another important indication for resection, is the fairly large group in whom thoracoplasty fails. On the other hand, Brewer, Dolley, and Jones (1) feel that before lung resection is used because of unsuccessful thoracoplasty, the following possibilities should be given serious consideration:

(a) Revision thoracoplasty; (b) the formation of extrapleural space and use of pack or plombage; and (c) cavity drainage.

Although an honest difference of opinion exists among thoracic surgeons in regard to primary lung resection versus thoracoplasty, the fact remains that resection of the lung either primary or secondary to thoracoplasty represents a new and more hopeful approach in the treatment of tuberculosis. The medical profession owes a vast debt of gratitude to the pioneers in this field who have made possible cures in otherwise hopeless cases.

Other special procedures in the hands of trained workers familiar and qualified in their specialty have a definite but limited use. Among these procedures are cavernostomy, plombage, oleothorax, extra-

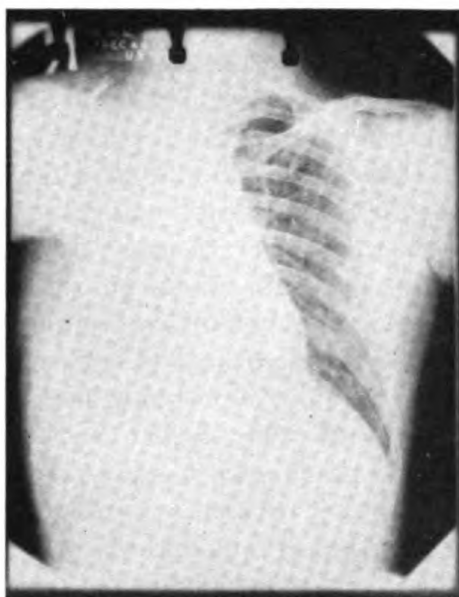


Figure 4.—Roentgenogram taken following resection of right lung and five rib thoracoplasty. Left lung fields clear. Gastric culture negative for acid-fast bacillus.

pleural pneumothorax, and segmental resection of the lung. No discussion of the present methods of treating pulmonary tuberculosis would be complete without briefly mentioning the antibiotic streptomycin. Streptomycin is a valuable adjunct in the treatment of pulmonary tuberculosis—it has not replaced conventional collapse procedures. It is of considerable value in the treatment of endobronchial disease, and by alleviating this condition it permits other forms of collapse therapy to be instituted. Newly developed thin-walled cavities often close rapidly with streptomycin, probably by eliminating obstructive endobronchial disease. Resorption of recent exudative and pneumonic lesions, acute hemoptoic and bronchogenic spreads, as well as miliary tuberculosis, have been reported improved under streptomycin therapy. Chronic fibrocaseous and fibrocavernous lesions show no response.

Here a word should be said about the indiscriminate use of streptomycin. As streptomycin has become more readily available, there has been a tendency to use it as a substitute for more conventional procedures. This cannot be too strongly condemned. Since the *Mycobacterium tuberculosis* eventually becomes resistant to streptomycin, continued treatment is not only a needless expense, but useless from a therapeutic standpoint once resistance has developed.

From a public health standpoint, there is a more serious potential source of danger, namely the development of streptomycin resistant pulmonary tuberculosis in the general public. Individuals who acquire this form of tuberculosis would be denied the use of streptomycin therapy when conventional procedures result in failure.

For this reason it is essential that periodic sensitivity tests be made during the course of streptomycin therapy and that treatment be discontinued as soon as resistance to the antibiotic becomes apparent.

In summarizing the advantages of various types of collapse therapy it is important to note that in skilled hands various procedures yield excellent results. In the hands of the unskilled the opposite is true.

Various collapse procedures should not be considered competitive. Thoracoplasty is not competing with resection. Pneumothorax is not competing with pneumoperitoneum. Each procedure has certain well-defined indications and limitations and all are competing against the tubercule bacilli. It is only by cooperating in this common purpose that the struggle against tuberculosis can be successfully terminated.

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Experiences With the Marrow Nail Operation According to the Principles of Kuentscher¹

Fresh Compound Fractures

PART II²

PROF. DR. C. HAEBLER

THE HEALING of compound bone fractures depends largely on the possibility of a primary wound excision. Unfavorable conditions because of the war limited the number of cases for reference to 76. The technique and experience of the surgeon, however, are decisive.

It is admitted that radical wound excision with primary suture of the skin as recommended by Boehler is ideal, but the limitations of this method must be recognized as well as the fact that experience and mastery of technique are required. If it is impossible to completely remove all injured tissue, and if the wound is infected, suture of the skin is fraught with danger, since the wound margins will come to early agglutination and the infected secretions will not drain off sufficiently, even if drains are applied, the secretions consequently will accumulate in the soft tissue and the bone. If signs or symptoms of wound infection are not observed, an incision of the skin 2 millimeters from the margins in the sound portion of the skin is made. We do not necessarily observe the 6- to 8-hour limit. All areas in which the blood supply is disturbed are removed without regard to a later covering of the wound. All pockets must be opened widely and all contaminated, contused, lacerated, or other injured and devitalized tissues thoroughly cut away until healthy tissues appear. Bleeding vessels must be pinched off immediately, and special care must be given to thorough removal of all damaged parts of the tendons and fascias; all contaminated sheaths of nerves and large vessels must be removed; and all exposed surfaces of bone cleaned, and contaminated

¹ Translation prepared by the U. S. Naval Technical Unit, Europe (Medical Section), Office of Naval Advisor, Office of Military Government (U. S.), edited by U. S. NAVAL MEDICAL BULLETIN.

² Part III of this article will be published in the September-October issue of the NAVAL MEDICAL BULLETIN.

loose particles removed (all other loose particles are kept in position as they may be helpful in the formation of callus). The wound is then given temporary tamponage and the linen and wound covering changed. After the bleeding vessels are tied off the nailing may begin. The guide rod is inserted from the fracture cleft into the proximal marrow cavity in thigh fractures only; in all other cases the procedure is the same as in simple fractures. A drain is carried down to the fracture, which must be led through the sound flesh (not through the wound) at a physically suitable place. The soft parts at the fracture site must be sutured as economically as possible but in such a manner that the bone is completely covered. Special drains must be inserted into large pockets in the musculature. If primary healing is expected the skin should be closed with adhesive tape (not sutured) if the condition of the wound permits.

I would like to emphasize again that, contrary to the opinion of Boehler, suture of the skin is fraught with danger and therefore it is better to abstain completely than to obtain a closure by plastic surgery. The healing of the fracture takes a long time and therefore there is no difference in the end result between healing by first intention or healing by granulation tissue. Only in leg fractures does plastic surgery seem to be indicated because there is no other possible covering for the tibia. In some cases we use adhesive tape as a cover.

The wound should be kept wide open and efficient drainage applied if symptoms of spreading infection are observed. In case of an acute infection it is better not to nail. It is necessary for the success of open fractures—in this connection I agree with Boehler—to obtain a stabile osteosynthesis by the nail; in all cases where this cannot be achieved it will be better to abstain from nailing.

Boehler stated that if the union of the fragments is not absolutely stabile, in instances such as spiral fracture at the upper or lower end of the bone, one or two wire sutures should be applied. I cannot agree with that, despite the fact that I have often treated compound fractures with wires and plates. It is possible to achieve a stabile osteosynthesis in these fractures (at least during the first weeks) if the technique (including length of nail) is correct. Therefore, the question arises: Why should an additional wire be used which will cause further injury by separating the periosteum? If a stabile osteosynthesis cannot be obtained by the nail, an additional wire loop will be of little benefit. This is my own opinion. If an infection occurs, the nail that does not forge a stabile union with the bone will permit a further extension of the infection.³ In such a case it would be better to use the wire loop or Lane's plate instead of nailing, thus

³ In Boehler's cases there were no compound fractures that healed aseptically with an additional wire loop. There were, however, some cases in which an infection occurred.

eliminating the possibility of the infection spreading in the marrow cavity.

One of the basic principles of the treatment of accidental wounds is to immobilize the injured limb as long as the danger of infection exists. The nail immobilizes the fragments but not the soft parts, therefore the limb must be kept immobilized after nailing. An unpadded cast with a window or an unpadded splint applied in such a way that it will stay in position while the dressing is being changed, will be found most suitable for this purpose.

The limb should be kept in such a position that the drain in the wound is at the most dependent point. If, however, Braun's splints are used the insertion site must be at the lowest point. Blood or wound secretions will easily drain off in the direction of the insertion site along the nail (which acts as an ideal drain) and will eventually cause an infection of that site.

FRESH COMPOUND FRACTURES

Nineteen fresh compound fractures of the femur were nailed.

A 20-year-old sergeant sustained compound fractures of his left thigh and leg in a motorcycle accident.

Left thigh.—There was a comminuted fracture in the middle of the femur; the central fragment was 4 centimeters long (fig 46a). The gaping wound was 6 centimeters long and reached to the bone.

Left leg.—Fracture of the middle third tibia and fibula (fig. 50); a lacerated contaminated wound, larger than a hand, with the bones projecting from it.

An operation was performed immediately; the thigh wound was widened and débrided, all contaminated portions of the muscles were removed, the blood staunched, and the fracture site exposed. The proximal fragment was elevated by means of a bone hook and a guide rod inserted into the marrow cavity and driven through the skin at the trochanter. A 38-centimeter marrow nail was then inserted, using the guide rod until the nail appeared at the fracture cleft. (A roentgenogram was not made to determine the correct length of the nail.) The guide rod was extracted and inserted over the nail from above. The bone fragment was slipped over the nail and then over the guide rod, and then the nail and guide rod were driven into the distal fragment until only about 2 centimeters were projecting out of the trochanter (fig. 46b). Marfanil-Prontalbin powder was sprinkled over all wound pockets and into the depth of the wound, three drains were inserted and the wound sutured.

Next the leg wound was débrided and the fracture nailed with one nail, leaving the fracture cleft gaping (fig. 47). A defect in the skin

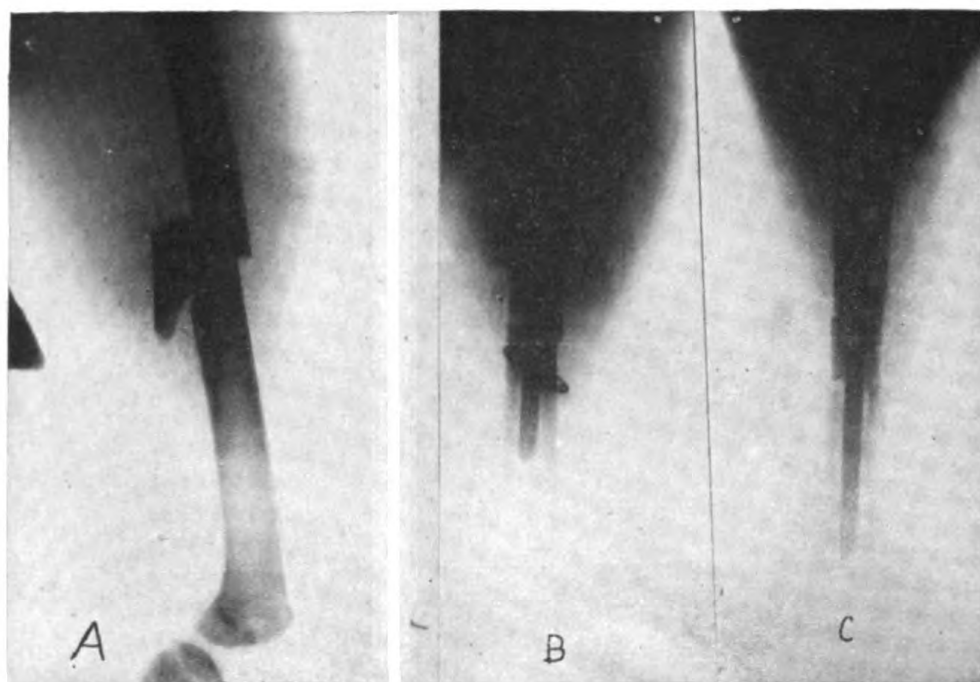


Figure 46a, b, and c.

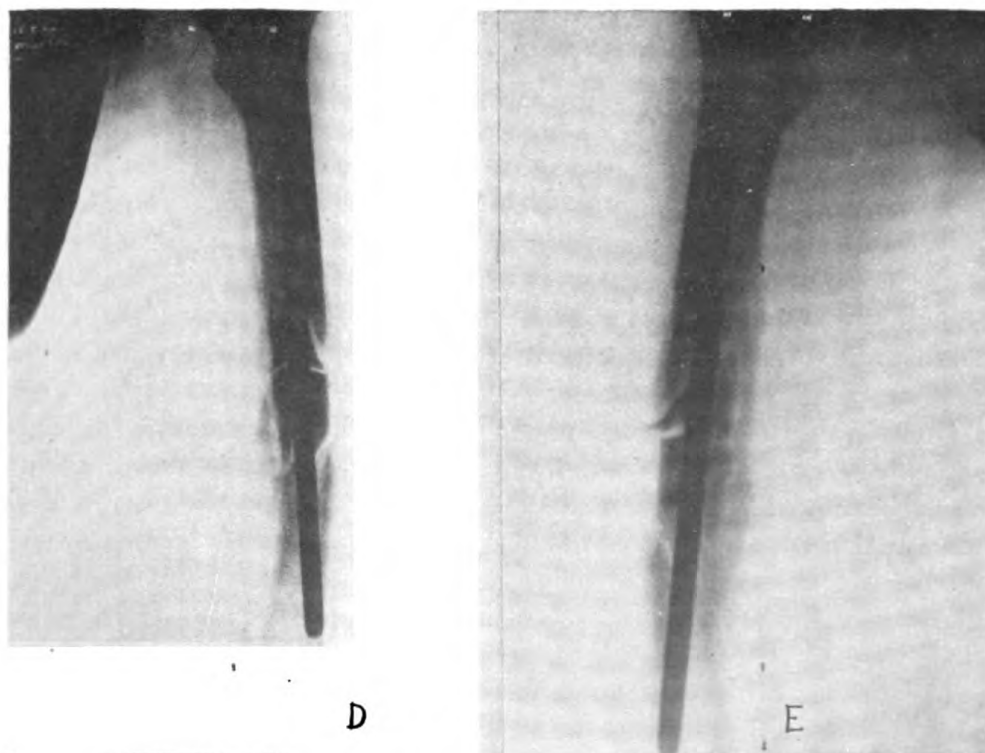


Figure 46d and e.

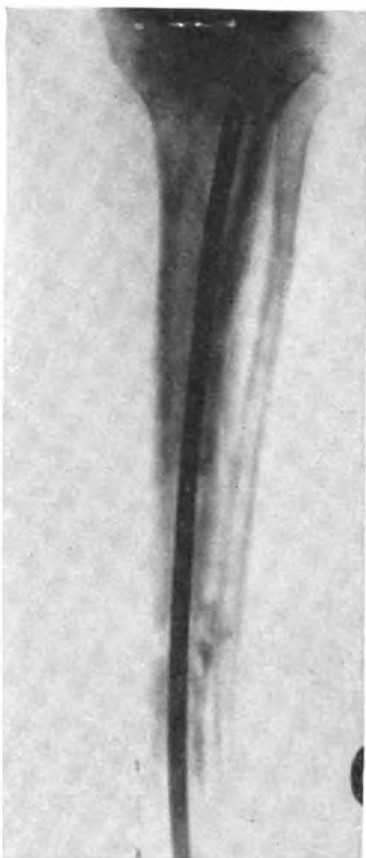


Figure 47.

prevented closing the wound so Marfani-Prontalbin powder was put in the wound and a drain inserted. The thigh and leg were then immobilized in a Volkman splint.

Although fever appeared, the dressings were not changed for 4 days. A considerable amount of secretions and pus was observed coming from the wound, therefore the sutures were removed and the wound thoroughly cleansed with a solution of Rivanol and Rivanol wicks inserted into the wound. These wicks were changed every other day.

Fourteen days after the operation a pelvic cast with a window was applied but 1 week later the wound had to be opened again because of the patient's high temperature.

A roentgenogram taken 4 weeks later (fig. 46c) showed a distinct rarefaction of the cortex of the distal fragment.

Retention of pus in the wound required further incisions and a third fragment became necrotic; a typical ring sequestrum was cast off from the proximal fragment (fig. 46d), causing a slight bending of the fracture.

Seven months after the operation an abundant formation of callus had formed at the inner side of the curvature bridging the fracture. This made it possible to subject the limb to weight-bearing. The leg wounds were closed but an ulceration of the thigh still existed (fig. 46e).

Nine and a half months after the operation the patient was able to walk and was granted leave.

Due to events of the war the patient did not return to the hospital but he reported that the nail was removed 1 year after the accident. Fourteen days after removal of the nail a refracture occurred. The bone healed in a varus position of 160° . Six months later another abscess was observed in the thigh and seven sequestra were removed. The wound healed and since then no other sequestrations have taken place.

The patient's hip was not affected but his knee and ankle joints have become stiff and there was a shortening of the limb of 6 centimeters.

It is difficult to decide whether or not the débridement of the wound was really sufficient. It is a matter of fact, however, that it is wrong to direct the drains through the wound. It was clearly shown by the course of the infection, how dangerous a sutured wound may become in cases in which the wound is not immediately opened wide⁴ after wound infection occurs. A stabile osteosynthesis was not achieved in this case because the nail was too short, therefore the infection of the fracture cleft, the necrosis of the middle fragment, the ring sequestrum at the proximal fragment, and the penetration of the cortex by the nail must be ascribed to the instabile osteosynthesis.

In the case of a compound fracture of the femur, as shown in figure 48a, the osteosynthesis was only relatively stabile. Nevertheless healing was achieved, but in this case the nail was applied 14 days after the injury when the wounds had healed.

The fracture in the central third was complicated because of a bleeding wound, 3 by 1 centimeter, on the inner side. The wound was débrided and sutured. Two days later a splint was applied and later a wire extension. Fourteen

days after the accident, when the wound was healed, the fracture was nailed by exposing it from the outer side. Two days after the operation a large hematoma at the fracture site was opened and irrigated with saline solution. With the exception of 2 days during which the patient ran a high temperature (12 days after the operation) the post-operative course was uncomplicated and 4 months after the accident the patient was released from the hospital, after removal of the nail, as fit for service.

The diameter of the marrow cavity below the fracture site was so wide that a true jamming effect of the nail could not be obtained, therefore the nail should have been much longer. The osteosynthesis

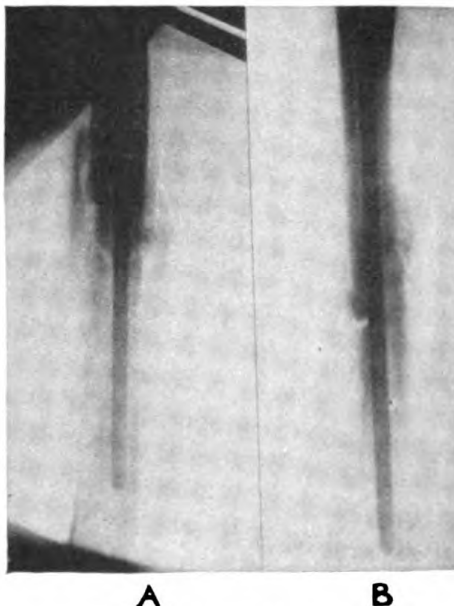


Figure 48.

⁴ I have noticed that young surgeons dislike to open wounds and therefore want to retain the skin sutures, consequently they hesitate to make a wide opening of the wound. Maybe they remember experiences with abdominal operations such as abdomen evisceration or abdominal hernia. I teach my assistants from the very beginning to renounce the suture of the skin entirely, even in abdominal surgery, when danger of infection exists. I even reject the so-called approximation sutures because they may easily lead to a true union of the skin.

was only relatively stabile, which is distinctly proved by the rarefaction in the area of the nail point as shown by the roentgenogram taken 9 months after the operation (fig. 48b).

It is less dangerous to wait for an aseptic healing after débriding the wound and then do the nailing operation after that. In such a case, however, we must take into consideration that we have to deal with a condition similar to simple fracture and should nail without exposing the fracture cleft. This result was achieved in six cases, four of which, however, must be considered only relatively stabile because of the peculiarities of the fractures.

In 12 cases of early primarily nailed compound fractures the osteosynthesis was stabile and all cases healed without disturbances of the wound.

In the 18 fractures which could be observed until a final healing occurred the treatment in the hospital lasted from 28 to 90 days; or an average of 69 days; however, the duration of disability was from 80 to 138 days or an average of 115 days. A distinct difference between the early primary nailing and the nailing after the healing of the débrided wound could be observed. All 18 cases healed without an impediment of the leg.

There is no doubt that the nailing of fresh compound thigh fractures has many advantages over the conservative treatment.

LEG FRACTURES

In our clinic all compound leg fractures were fixed by the twisted wire method or Lane's plates. If, however, wound débridement was possible⁵ we frequently used the marrow nail. We not only treated those cases which were "very suitable" (cases of this kind are rare) but also those in which the osteosynthesis was only relatively stabile (oblique and spiral fractures below the middle). It must be admitted that many mistakes have been made (by using nails which were too short or by subjecting the limb to weight-bearing too early). This same condition prevailed in field hospitals.

A total of 39 fresh compound leg fractures were nailed; the course of 29 was observed to final healing.

In these 39 cases of nailed fractures an infected wound was observed in 12; in 4 cases the infection extended to the bone and caused a casting off of sequestra.

The comminuted fracture illustrated in figure 49a was complicated by a wound larger than the palm of a hand. The muscles were badly torn and there were several bone splinters in the wound. The

⁵ In general small, smooth wounds out of which bone splinters were projecting were not débrided by us. Cases of that kind were treated conservatively.

skin surrounding the wound was lacerated and contused and there were several abscesses on the skin of the leg. It was impossible to cover the entire bone with soft parts after the excision of the wound and nailing. The loose bone fragments were removed. The nail stabilized the fracture satisfactorily (fig. 49b), consequently a serious infection did not occur. Where the bone was exposed cortex sequestrae were cast off making the fracture cleft wider, but the broken off splinter was well attached to the bone (fig. 49c). Eight months after the operation the wounds had closed except for a small fistula. The nail was removed because the fracture cleft was bridged over by bone. At the fracture cleft a very small sequestrum was observed, which was removed 14 days later. After that the wounds healed

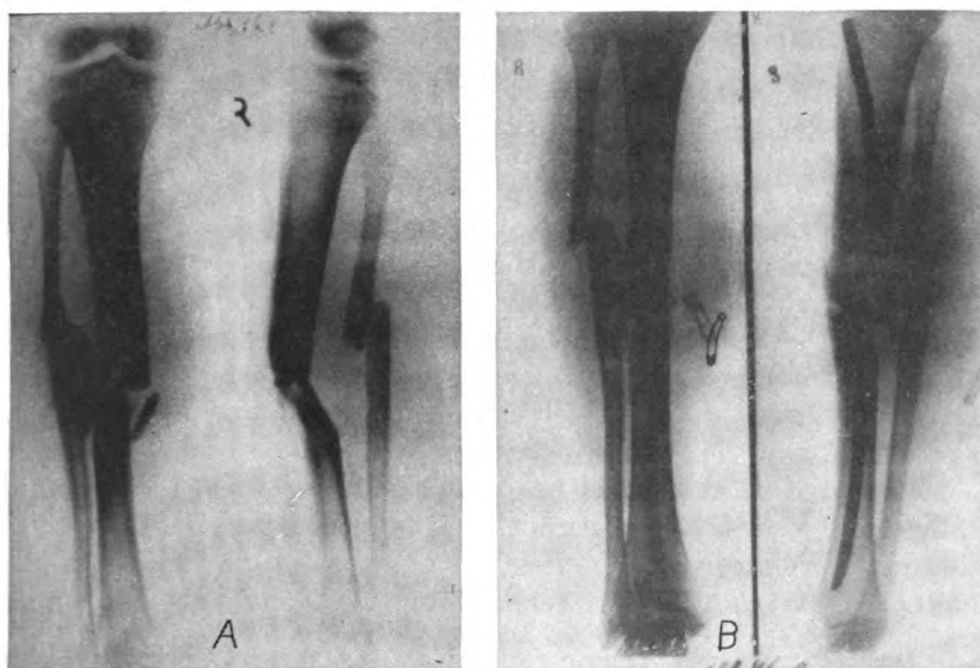


Figure 49a and b.

quickly and the patient was released from the hospital. Examination made 11 months after the accident showed the wounds and the leg abscesses to be healed and the fracture cleft completely stable and suitable for weight-bearing. There was no shortening of the leg, but a 25 percent impediment of the ankle was observed. The roentgenogram (fig. 49d) showed insufficient callus at the medial side and there were no signs or symptoms of osteomyelitis.

In the fracture shown in figure 50a a considerably smaller, relatively smooth oblique wound existed at the level of the fracture site. This was débrided and primarily sutured. After the nailing the fracture was clinically stable but the osteosynthesis was only relatively stable because the fracture was deep-seated. The nail could have been

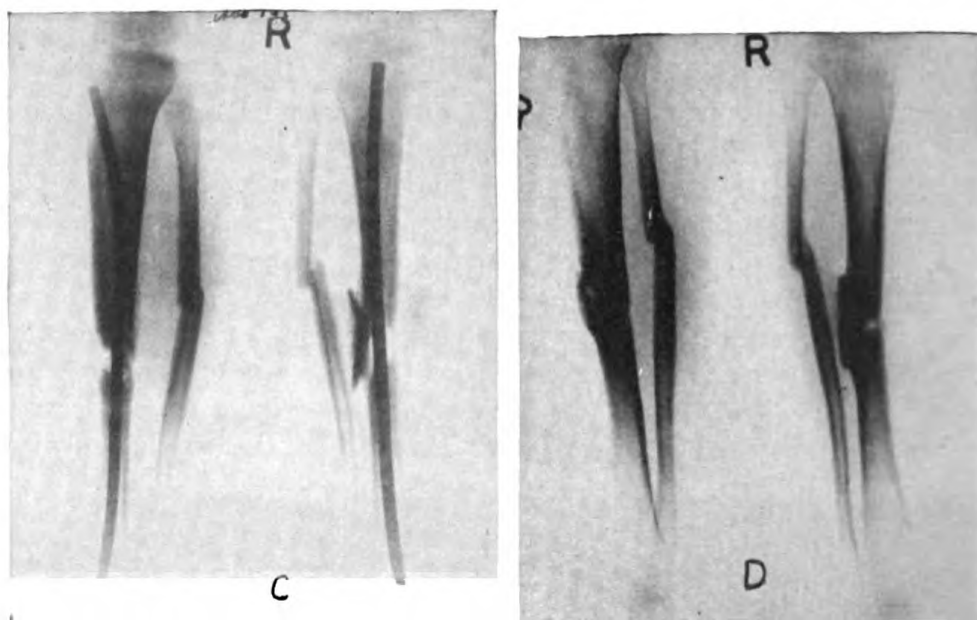


Figure 49c and d.

longer, therefore a plaster U-splint was applied (fig. 50b). Two days after the operation the patient's temperature rose, consequently the wound was opened wide and purulent bloody secretions discharged. Despite the fact that a cast with a window had been applied an osteitis occurred at the fracture cleft (mainly of the proximal fragment) and at the separated fragment. An infection of the marrow cavity, however, was avoided (fig. 50c). A portion of the fragment was cast off as a sequestrum, but a good periosteal formation of callus bridged over the fracture cleft. Four months after the operation rarefaction of the spongiosa was observed in the vicinity of the nail (fig. 50d). After the removal of the sequestrum the wound

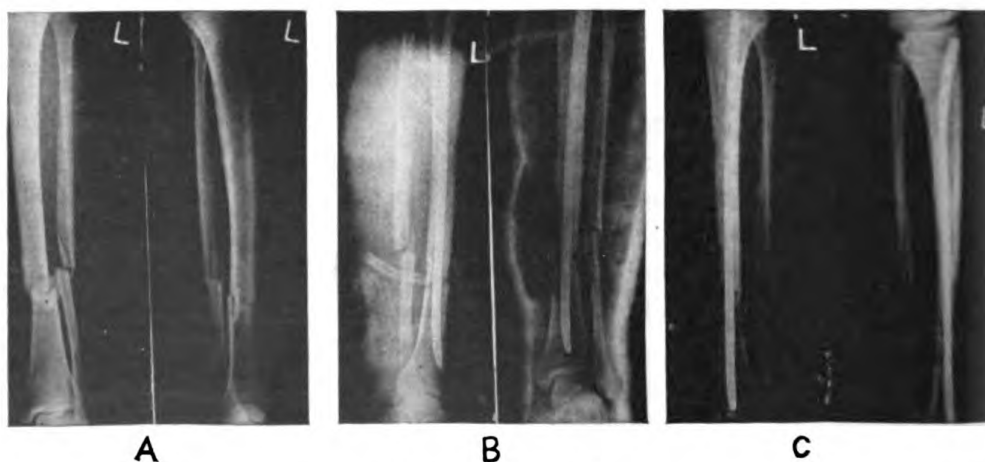


Figure 50a, b, and c.

closed and 5½ months after the accident the fracture had healed to such an extent that the nail was removed. An examination 6 weeks later showed that the nail channel could be recognized only at the insertion site. A coarse defect with two small sequestra was observed at the fracture cleft which, however, was not surrounded by sclerotic bone (fig. 50e).

No fistula, swelling, or impediment of the limb was observed. The two sequestra were spontaneously cast off and an examination made 1½ years after the accident showed the fracture cleft barely discernable and no limitation of the movement of the leg. The fracture had come to an ideal healing.

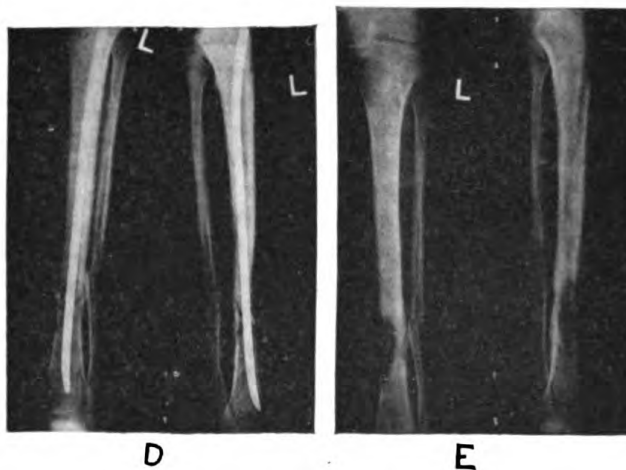


Figure 50d and e.

TABLE 5.—Healing of the wound in fresh compound leg fractures

[S = Stable osteosynthesis. RS = Relatively stable osteosynthesis.]

	Total cases		Good healing of the wound		Wound infection		Formation of sequestra		Infection of marrow cavity		Late abscess	
	S	RS	S	RS	S	RS	S	RS	S	RS	S	RS
Primary suture of wound.....	6	9	3	0	3	9	0	3	0	1	0	0
Wound approximated with adhesive tape.....	11	6	11	6	0	0	0	0	0	0	0	1
Wound kept open.....	2	2	1	2	0	0	1	0	0	0	0	0
Closed nailing after healing of débrided wound.....	3	0	3	0	0	0	0	0	0	0	0	0
Total.....	22	17	18	8	3	9	1	3	0	1	0	1

NOTE.—Out of a total of 39 cases 26, or 66 percent, came to good healing; 12, or 30 percent, were infected; 4, or 10.3 percent, had sequestra formation; 1, or 2.6 percent, developed marrow cavity infection; and 1, or 2.6 percent, had late abscesses develop.

In this case the wide opening of the wound and the sufficiently long period of immobilization of the limb obviously prevented the infection of the marrow cavity.

Boehler rejects the nailing of compound leg fractures because serious infections occurred in 21.7 percent of the 47 cases treated by him, whereas in the conservative treatment only 6.2 percent of the cases became infected. In our own material only in one case did a serious infection occur and it could have been avoided. Wound infections occur more frequently but only in those cases in which the wounds were

primarily sutured, therefore there is no reason to reject a marrow nailing of fresh compound leg fractures because of an increased danger of infection. We do warn, however, against suturing the wound.

Unfortunately only 29 cases could be observed until final healing occurred. The results obtained, the length of the stay in the hospital, and the length of time necessary to restore them to employment are noted in table 6, compared with the 80 cases of Ehalt.

TABLE 6.—Average duration of treatment and results obtained in fresh compound leg fractures

	Number	Average duration of stay in hospital	Average duration of disability	Final results			
				I ¹	II ²	III ³	IV ⁴
Marrow nailing.....	29	80	127	26	2	1	.....
Conservative treatment (Boehler-Ehalt).....	80	.....	183	50	23	6	1

¹ Healing without shortening, angulation, or impairment of the joint.

² Slight angulation, shortening, or impairment of the joint.

³ Marked angulation, shortening, or impairment of the joint.

⁴ Pseudarthrosis.

The results obtained are distinctly better and therefore we believe that the nailing of suitable fresh compound leg fractures would be preferred to the conservative treatment.

Open oblique fractures, spiral fractures in the distal third, and fractures near the joint are not considered suitable for the nailing operation because, it cannot be ascertained whether the nail will forge a stabile union or not. If this question must be answered in the negative (and it is not possible to say in advance with certainty) an infection of the marrow cavity may be expected. An additional wire loop cannot prevent that. This has been proved by the experiences of Boehler. In those cases the osteosynthesis was obtained by a wire loop (in oblique fractures) or a Lane's plate (in transverse fractures) just as my teacher Fritz Koenig did it and as Boehler recommends. In such a case, however, a plaster cast is required which must be kept in place until final healing occurs.

FRACTURES OF THE HUMERUS

The course of 16 of our 17 cases of nailed compound fractures of the humerus could be observed until a final healing was obtained. In one case a serious wound infection occurred which had extended to the elbow joint and consequently caused a stiffening of the joint. There is no doubt that this infection was due to insufficient débridement and the late opening of the wound.

The transverse fracture of the humerus near the limit of the middle and lower third was complicated because of a 5-centimeter transverse soft tissue wound and the complete separation of the flexor muscle.

During the wound excision it was observed that the brachioradialis was torn off at its insertion (the wound was not extended to the elbow). Despite the fact that a paralysis of the radial and the median nerves existed, only the radial nerve was exposed. It was not severed but at the level of the fracture cleft an endoneural hematoma was observed. After the nailing, which was made from the distal side and which resulted in an absolutely stabile osteosynthesis, the wound was drained and a suture applied after dusting with Marfanil-Prontalbin powder. A plaster splint was then applied. The patient's temperature was not higher than 38° C. and consequently the drain was removed on the second day, but in the evening after the drain was removed the temperature rose to 39.2°C. No symptoms of reaction appeared so the wound was not opened. The temperature remained between 38° and 39°C. and the wound seemed to be healing. An edematous swelling of the area of the elbow joint and of the forearm was observed. Eight days after the operation the temperature rose to 40° C. and after opening the wound a large quantity of pus drained off. After that we observed abscesses at the elbow joint and on the forearm and a casting off of large necrotic muscle and fascia parts. The elbow joint became stiff. The paralysis of the radial and the median nerves was not improving and the final result was a stiff elbow joint (at an angle of 110°), a considerable stiffening of the wrist, and contractures of the fingers with a paralysis of the radial and the median nerves.

Despite the bony healing of the fracture several sequestra were cast off from the fracture cleft. The nails were removed 4 months after the



Figure 51.

accident, but after the extraction of the nails several sequestra were cast off from the fracture site and at the nail insertion site and repeated formation of fistulae was observed at the olecranon. One year after the operation the bone was opened at the nail insertion site and some small sequestra were removed. An examination 2 years after the accident (fig. 51) proved that the wounds healed without any reaction and there was no further evidence of inflammation.

There is no doubt that the infection was due to insufficient débridement. It was absolutely necessary to have exposed the area

of the separation of the brachioradialis and to open this pocket and insert a drain. Sulfonamides are no substitutes for thorough débridement. It may be that the delayed appearance of the infection can be ascribed to the sulfonamides, and it is because of this delay that we were mistaken (low temperature) and consequently the wound was not immediately opened. An immediate wide opening of the wound would have prevented the infection of the elbow joint and possibly of the bone. Considering all the mistakes we made even conservative treatment by the application of a wire suture would not have prevented an infection of the fracture cleft. The extension of the infection to the marrow cavity, however, and the formation of sequestra would certainly have been avoided if a marrow nail had not been used, therefore we agree with Boehler that the marrow nail method facilitates the treatment of fractures but at the same time it may cause infection.

In spite of these hazards there is no reason to abandon the nailing method of fresh compound fractures of the humerus and to apply the older methods, if it is possible to obtain a stabile osteosynthesis.

It is our opinion that an additional wire suture or wire loop (as recommended by Boehler) is not required. Contrary to the findings in old fractures, the musculature is intact, therefore the affected arm must be kept in the elevated position during confinement to bed, after the application of a plaster U-splint. When getting up the arm must be held in this position by means of an abduction splint. When the wounds are healed the elbow must be given some passive motion with the sling in place (which may be removed 3 weeks later at the earliest). In all cases treated in this way we never observed a distraction of the fragments. On the contrary we even observed a pressing together of the fragments following exercises.

If the nail does not find sufficient hold in the bone it is not only superfluous but disadvantageous. The additional wire suture cannot prevent the nail from getting loose in the bone because of the movements of the limb and when infection occurs it will be transferred to the marrow cavity by the nail.

The period of hospitalization, the period of disability, and the results achieved in our 16 cases are summarized in table 7. Seven compound fractures mentioned by Ehalt would have been suitable for the nailing method; the results obtained in these are compared with our cases.

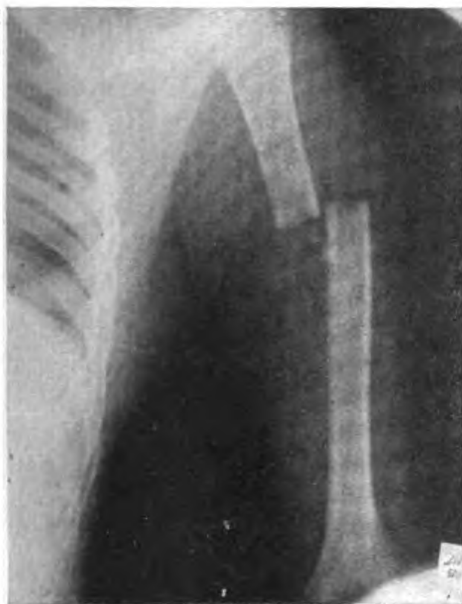
TABLE 7.—*Time of treatment and results obtained in fresh compound fractures of the humerus*

	Number	Average duration of stay in hospital	Average duration of disability	Final results			
				I ¹	II ²	III ³	IV ⁴
arrow nailing.....	16	58	131	15	0	1	0
conservative treatment (Boehler-Ehalt)....	7	-----	168	5	2	-----	-----

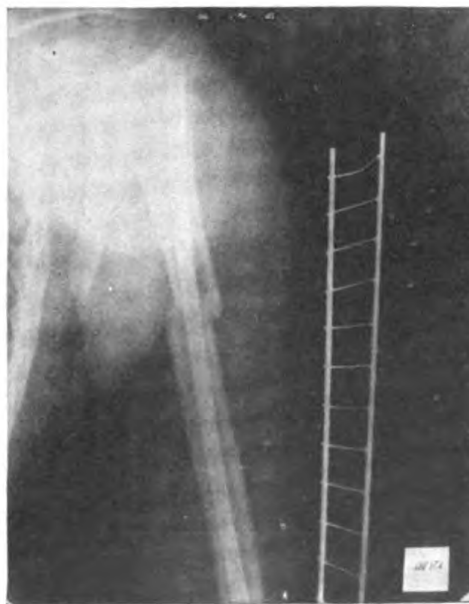
¹ Healing without shortening, angulation, or impairment of the joint.² Slight angulation, shortening, or impairment of the joint.³ Marked angulation, shortening, or impairment of the joint.⁴ Pseudarthrosis.

Disregarding the avoidable result noted in 3, some advantages in comparison to the conservative treatment are clearly noticeable, but the differences are not very great. In case of an infection, however, complications may arise from the nail, therefore, the strictest indication possible is required. All surgeons who are not well acquainted with the treatment of simple fractures, the technique of the nailing, and first of all, with wound débridement should not nail compound fractures.

In one case a closed nailing was made after the healing of the débrided wound. In another a nail was applied on the third day despite the fact that the wound was not yet closed. The wound showed no symptoms of reaction. Although an infection did not occur, this kind of treatment is not advisable, according to our own experience. From the technical point of view the open nailing is



A



B

Figure 52a and b.



Figure 52c and d.

much more simple and the fracture is immediately immobilized, which helps to fight infection. However, complicated reductions are necessary in closed nailings, consequently damage to the soft parts cannot be avoided. This is another source of infection.

At the same time we think it unwise to perform the closed nailing first and then débride the wound. This procedure was followed in one case of compound fracture in which bones projected, but fortunately an infection did not occur. One never knows (and this is particularly true for small wounds) to what extent the soft parts are damaged and whether or not any dirt or parts of the clothing were carried into the wound by the bone; the bone ends or the wound cannot be carefully examined after the nailing.

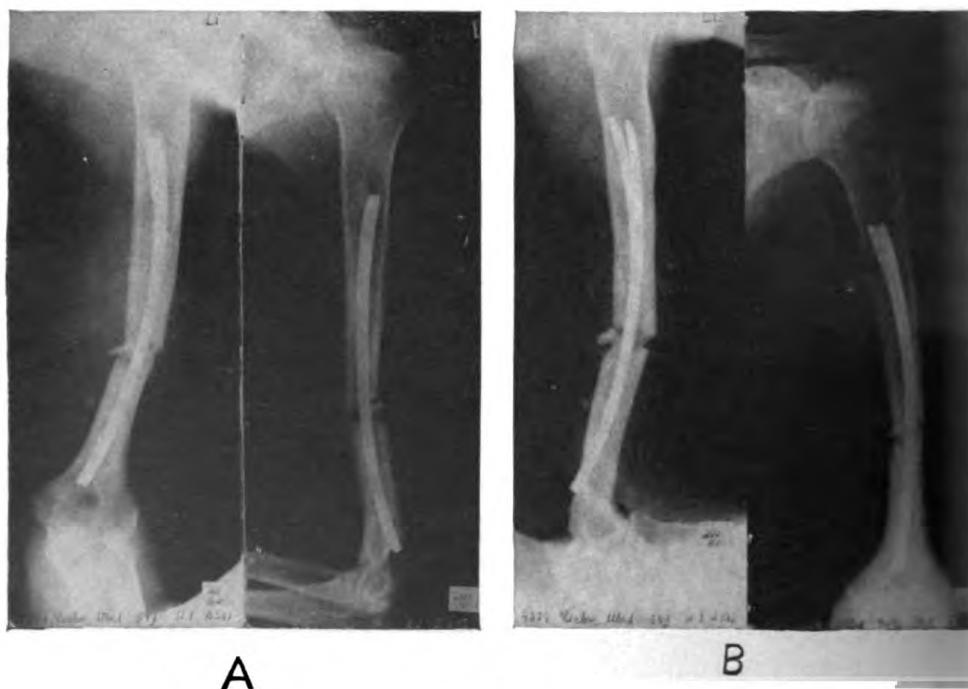


Figure 53.

Figure 52a is an illustration of a compound transverse fracture of the humerus with a lacerated wound of the soft parts. The wound was débrided and the fracture nailed from the proximal side. Drains were placed and the wound closed with adhesive tape. The arm was put at rest by means of a Kramer splint and an arm sling. Two days after the operation the patient's temperature was normal and the drains were removed. The nail had stabilized the fracture (fig. 52b) and the wound began to heal. Fourteen days later the splint was removed and the arm subjected to active exercise with the arm still in the sling. The patient was released from the hospital on the twenty-first day, the wound being healed. Four weeks post-operatively the fragments had pressed together by exercise movements (fig. 52c) and callus had begun to form. There was no impairment of the arm. Four and a half months after the operation (fig. 52d) the fracture had united and healed.

Figure 53a is an illustration of a compound fracture of the humerus with a lacerated wound 5 cm. long. The wound was débrided, a drain inserted, and the skin approximated with adhesive tape. The drain was removed 24 hours later, as the wound had begun to heal. Eight days later the patient began active exercise. Fourteen days later (fig. 53b) the fragments had been pressed together by exercise movements.

FRACTURES OF THE FOREARM

In our clinic compound fractures of the forearm were not nailed because, according to past experiences with simple fractures, it is not possible to obtain a firm pressing together of the fragments with the nail. This is particularly true for all cases in which only one bone is broken. In such cases wire suture gives the best results.

Observations made by other surgeons seem to confirm our own opinion.



Figure 54a and b.

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C

Figure 54c.

In a compound ulna fracture with a dislocated radius head the fragments were in firm apposition in a slight valgus position after nailing (fig. 54a). The wounds healed primarily and the patient was able to begin some exercises 2 weeks later and was released from the hospital 3 weeks later. Examinations made at intervals of 4 weeks did not reveal any formation of callus and 3½ months after



A



B

Figure 55a and b.

the operation the fracture was distracted (fig. 54b). The nail was removed 4 months later and the final result was a pseudarthrosis (fig. 54c).

In the fracture illustrated by figure 55a, which was complicated by serious damage of the soft parts in the distal third, a nail inserted into the radius split the bone, because the marrow cavity was very narrow. The ulnar fragments



C

Figure 55c.

were united by means of a wire suture (fig. 55b), after which the radius fracture cleft was still gaping. The wounds which were kept open healed by granulation. Three weeks later the cast was removed and the limb subjected to some exercises. As a consequence a displacement of the ulnar fragments occurred which caused a pressing together of the radius fragments. In spite of this condition not even the slightest formation of callus was observed 10 weeks later (fig. 55c). In our experiences compound fractures of the forearm, in which there is fistula formation, are not suitable for later marrow nail operation.

SUMMARY

Any success of the nailing of fresh compound fractures depends largely on correct débridement (just as in any other compound fracture treatment).

Suture of the skin is always dangerous and its application should by no means be enforced.

The wound margins may be approximated by means of 3 broad bands of adhesive tape; this procedure is much better than suture of the wound.

If it is not possible to obtain a tensionless union of the skin margins it will be much better not to attempt their suture.

If possible the bone should always be covered by soft parts. In case of the leg, transplants of skin may be required.

If the 8-hour limit has passed or if the wound is contaminated with grease or dirt, it must by all means be kept wide open.

The marrow nailing is not indicated in case of an acute local or systemic infection.

Compound fractures should be nailed only if a stabile osteosynthesis can be obtained. In this connection we should desist from any attempt to stabilize the fracture by applying an additional wire suture. If a stabile osteosynthesis cannot be obtained with the nail it will be better not to apply it because the nail facilitates the spread of infection.

If an infection occurs the wound must immediately be opened, otherwise serious complications will occur.

An additional immobilizing cast should be applied in all potentially infected cases of nailing operations, until the danger of infection has passed. In these cases a drain should be inserted at the most dependent point.

The nailing of fresh compound thigh fractures is so advantageous in comparison to all the other methods (if a stabile osteosynthesis can be obtained) that it must be considered the method of choice.

If, because of the location of the fracture site, only a relatively stabile osteosynthesis can be expected, it will be best to excise the

wound first and then wait for healing with the limb in wire extension. Two to three weeks later the closed nailing may be performed.

Suture of the wound is dangerous in fresh compound leg fractures, particularly in those cases in which the osteosynthesis is only relatively stabile; in these cases the results obtained with the nailing method are better in comparison to those obtained by conservative treatment provided the nails are applied in the technically correct manner and the osteosynthesis is at least relatively stabile.

In cases in which the osteosynthesis is only relatively stabile proper consideration must be paid to too early removal of the additional protecting cast and to weight-bearing, otherwise late abscesses may occur.

Open oblique and spiral fractures and proximally located fractures are unsuitable for the nailing method. In these cases it will be better to treat the fractures by other means.

In fresh compound fractures of the humerus the results obtained by the nailing method are not considerably better than those obtained by conservative treatment.

It is a fact that the marrow nail method is much more simple but in cases of infection the dangers arising from the nail are much more serious and these complications are not observed in other methods. Therefore the most strict indications possible are required and the marrow nail operation should be made only by those surgeons sufficiently experienced in nailing closed fractures; and if a nailing is indicated the operation should be primary and open.

In fresh compound fractures of the forearm the marrow nail method shows no advantages, therefore it will be better to treat these fractures by other methods.

To be continued in the September-October issue of the
NAVAL MEDICAL BULLETIN



Group Psychotherapy in a Naval Disciplinary Barracks

Preliminary Report ¹

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INDIVIDUAL psychotherapy is considered the ideal method of psychiatric treatment, but limitation of time and personnel have made it necessary to explore the possibility of giving such treatment in groups, especially in the Armed Forces. There is considerable literature on this subject, provoked by the recognized need of extending to as large a number as possible the limited amount of psychotherapy available. A search of the literature reveals few reports on group psychotherapy in penal situations. A news article in the *Prison World* (1) states that group psychotherapy has recently been introduced into some of New Jersey's correctional institutions. Curran (2) in an article on group treatment states, "The use of group therapy techniques in prison, however, is almost nonexistent." In a limited distribution publication of the United States Bureau of Prisons, Wrye (5) describes his experiences with a single group therapy class. His experience closely parallels our own.

The need for psychotherapy in a disciplinary barracks is quite apparent, but the capacity of the psychiatric department to give individual therapy is so limited as to be discouraging. It seemed desirable, therefore, to investigate the practicability of group psychotherapy at this institution. In the absence of previous studies, it was felt that the authors' experiences in this field might be of value to others.

From the standpoint of the institution it is necessary to consider the value of group therapy from two viewpoints (*a*) the administrative, and (*b*) the therapeutic. From the administrative standpoint, group therapy would be considered desirable if it improved the efficiency of the psychiatric department by allowing the treatment of a large number of men in less time with a small staff. From the administrative viewpoint, it must also be considered whether the improvement of the morale of the inmates with the resultant decline

¹ From the United States Naval Disciplinary Barracks, Portsmouth, N. H.

in disciplinary infractions is sufficient to balance the problems of managing group sessions and the consequent loss of time from their institutional work assignments.

Therapeutically, it is felt that the objectives of group psychotherapy may be defined as follows: (*a*) emotional catharsis with release of tension, feelings of aggression, and hostility in a socially accepted manner; (*b*) reeducation and reidentification of aims; (*c*) socialization, achieved through group support and cohesion, and ability to adjust in the group situation; (*d*) realization of the universality of symptoms; (*e*) reassurance; (*f*) resolution of conflicts; and (*g*) development of insight.

There is a greater unanimity of opinion as to the aims of group therapy than there is in its definition and its application. Almost every article published has its own definition of group therapy. We will avoid this controversy by quoting the definition of Cotton (*3*) which seems to be as satisfactory as any given: "I would define group therapy as an attempt to reinforce and strengthen the individual's defense against anxiety by identification with, analysis by, and support from the group."

METHOD OF CONDUCTING GROUP THERAPY

The methods of approach to psychotherapeutic groups has varied from the completely passive, nondirective attitude to the positive authoritative advice frequently given so effectively by the family physician. In a recent article on group psychotherapy in Veterans' Administration hospitals, Kline and Dreyfus (*4*) classified the approach to group therapy as follows: (*a*) Passive nondirectional; (*b*) active nondirectional; (*c*) active and semidirectional; (*d*) active directional; (*e*) the didactic approach; and (*f*) semistructured (psychodrama). The best results seem to be attained by those therapists who are able to join in and be accepted as members of the group. The therapist must join in the discussion actively, not as an authoritative figure but as one of the group and through his skill and special ability maintain the direction of the discussion without appearing to do so. With this in mind we tried the active semidirectional approach and found it best suited to our purpose. By active semidirectional approach we mean that the therapist joins in the discussion as a member of the group, following the lead of the others and guided by the interest and needs of the group members as these become evident. He must, on the other hand, guard against irrelevant "bull sessions" and evasions of significant or difficult problems. The didactic approach failed to hold the interest of the group.

In the initial two groups it was decided to have two sessions a week for one group and three sessions for the other. Group No. 2 was

scheduled to have their sessions during working hours and Group No. 1 to have their sessions after working hours. We wished to try the after working hours meeting for two reasons: (a) To occupy some of the free time of the group; and (b) to keep as many men busy at their usual tasks as possible during the working day. Three sessions a week was found to be too frequent from the practical standpoint of work load for the therapist and also because the group did not seem to assimilate the material between the sessions. Two hours a week was more practical and seemed adequate to achieve our purpose. The after-hours session was completely impractical because the hostility of the group to "being treated on their own time" instead of "on the Government's time" so disturbed rapport that the plan was abandoned after the first month. The sessions were conducted as informally as possible, at first in the more formal atmosphere of the therapist's office, but more recently around a conference table in a room apart from the sick bay decorated with drapes and pictures. The only concession to classroom atmosphere was the presence of a blackboard and a few charts. We decided to select arbitrarily 16 to 20 sessions as constituting a course of treatment. We were somewhat concerned at first as to whether the psychiatrist, representing as he did the military authority, would be accepted by the group. However, the acceptance of the therapist seemed based in the individual rather than his military status. The civilian psychologist was accepted at first more freely but as the groups got underway rapport and group cohesion seem to have been equal in both groups. The familiar presence of the civilian in the sick bay undoubtedly facilitated his acceptance as a therapist.

SELECTION OF PATIENTS

Having no precedent to follow in the selection of men for group therapy we decided to pick our first two groups from the men who seemed most in need of help. Group No. 1 was, therefore, composed of the 10 men who had been on sick call most frequently during the preceding 6 months, and Group No. 2 was composed of the 10 men who had had the most disciplinary actions during the same period. The details of these two groups are shown in tables 1 and 2. On the basis of our experience with these men we learned that this was not the best method of selection. We decided that future groups would be picked on the basis of individual interviews which would determine the man's adaptability to the group and his need for therapy. Groups No. 3 and No. 4 were, therefore, selected on this basis. The composition of these groups is shown on tables 3 and 4 and the reason for their inclusion in the groups on table 5. We feel that the first two groups derived definite benefit from the sessions but, as indicated by their comments, on the whole, retained a resistance to therapy

throughout its course. The criteria for selection for group therapy are still flexible and a little vague but our basis for choice at present is: (a) need for therapy as expressed by inmate or in the opinion of the therapist; (b) acceptability of inmate to the group; (c) suitability of inmate's problems for group discussion; (d) favorable prognosis; (e) need for socialization; (f) expressed desire or willingness of inmate to join the group; and (g) ability of inmate to profit from these group sessions. If the man fitted into any of the above categories, he was selected regardless of age, educational level, or diagnostic categories.

TABLE 1.—Group 1: Selected because of frequency of appearance on sick call

Clinical description	Age	Educational level in grades	Restoration to duty risks	Comment
(1) Impulsive-unstable	21	9	Poor	"It doesn't add up. . . . doesn't make sense. . . . I want to be left alone."
(2) Unstable	22	6	Fair	"I'd rather come individually. I think the class helps. I don't do much talking because it is difficult to express my thoughts."
(3) Homosexual	19	11	Unsuitable	"I got nothing out of the classes. I come because I sort of help the class. I learn something every time I come up."
(4) Inadequate-unstable	18	6	Poor	"I think it's O. K. It helps me out I guess. I don't go to the sick bay so much."
(5) Normal range	25	10	Fair	"It is interesting, nice, but I have other worries. I learned something out of it, that worry makes you sick."
(6) Normal range	21	9	Poor	"I believe the class will help some fellows, but I don't need that kind of help."
(7) Immature	19	9	do	"Something like this will help me to observe things and symptoms and help me to think it over. One thing I don't like is the comments of the boys."
(8) Psychopathic personality.	17	10	Unsuitable	"It takes away our free time. We would never say what we feel. I don't want to come."

TABLE 2.—Group No. 2: Selected because of frequency of being on report

Clinical description	Age	Educational level in grades	T. O. R. ¹	Restoration to duty risks	Comment
(1) Immature, inadequate.	17	7	10	Poor	"I didn't pay much attention. I just sat there day dreaming. If they keep on, I'm going to pay attention and learn something."
(2) Psychopathic personality.	19	9	6	Unsuitable	"Most everything they talk about, I already know. It is all right."
(3) Personality disorder	21	6	5	do	"I don't gain anything I don't lose anything."
(4) Inadequate, unstable	19	9	5	Poor	"I would rather be out working."
(5) Psychopathic personality.	17	8	5	Unsuitable	"Not interested."
(6) Inadequate, unstable	20	6	5	Poor	"No comments."
(7) Personality disorder	21	9	5	Unsuitable	"Time passing too slow. Can't get to work after sessions."
(8) Immature, impulsive.	18	11	4	Fair	"I felt better the first times. It's not doing me any good."
(9) Psychopathic personality.	19	-----	4	Unsuitable	"My mind is not in the group. It would be all right if you paid attention."

¹ Number of times on report in previous 6 months.

TABLE 3.—Group No. 3: Selected because of need for therapy

Clinical description	Age	Educational level in grades	Restoration to duty risks	Comment
(1) Personality disorder.....	29	7	Unsuitable....	"I think it helps to talk about that you have made a mistake in the past. It might help it from happening again."
(2) Irresponsible, psychopathic traits.	20	7	Poor.....	"I think this class is very interesting and I think it is very helpful, but I believe it will make a normal man suspicious. I don't think that will help any."
(3) Personality disorder.....	18	10	Unsuitable....	"I like being here, because I am learning things I was never taught before."
(4) Immature.....	21	10	Poor.....	"This class is very interesting and I would like to take a deeper course in it, as I think it helps me in my outlook in future life."
(5) Dull, inadequate.....	28	9	do.....	"I believe in a way that the meeting has helped me greatly. I have learned a lot of things I never knew about."
(6) Psychopathic personality.	28	5	Unsuitable....	"I've acquired certain knowledge in this class which shall be very useful to me."
(7) Immature.....	19	9	Poor.....	This man was previously in group 1 and asked to get out of the group. He subsequently asked to be restored to the group for reasons not very clear.

TABLE 4.—Group No. 4: Selected because of need for therapy

Clinical description	Age	Educational level in grades	Restoration to duty risks	Comment
(1) Immature.....	20	9	Poor.....	"I think this project gives a man a chance to blow off steam and get a lot of things off his chest. We need more of it."
(2) Personality disorder...	18	9	do.....	"I believe that this project a man can learn what is the matter with himself and correct it. I think that through psychology in school and institutions of all sorts is helpful to the person and the public, to make a better Nation. I personally like it."
(3) Inadequate, impulsive	20	9	do.....	"I think this class can help me as well as others. Some of the questions have their good points and as they go along may or will help us when we are freed from this place. And I am glad to be a member of this class."
(4) Immature.....	25	8	Good.....	"No statement."
(5) Immature, inadequate..	20	8	Unsuitable....	"These classes are a help to the average man and relieves a lot of his worries. I think it is a great help and should be carried on with a lot more classes. You learn things in this class that others would like to know."
(6) Personality disorder...	22	8	do.....	"I feel that it is doing me a lot of good. I am learning quite a few things about life and people."
(7) Personality disorder...	27	12	do.....	"I don't like it."
(8) Dull, inadequate.....	23	8	Poor.....	"This project in my opinion is a very excellent idea, but the method as I see it is not effective as I would like it to be. For example: If we're given topics for discussion to look up and organize a debating team among ourselves, I think we could derive more benefit from these discussions."

TABLE 5.—*Psychiatric reasons for inclusion of men in groups Nos. 3 and 4.**Group III*

(1) Personality disorder-----	Prepsychotic, seclusive, in need of socialization.
(2) Irresponsible, psychopathic traits--	Included at request of subject No. 5 who "felt that he would benefit."
(3) Personality disorder-----	Seclusive, resentful, schizoid, considered in need of catharsis and socialization.
(4) Immature-----	Restless, in need of orientation to future goals.
(5) Dull, inadequate--	Severe anxiety manifested by incapacitating headaches.
(6) Psychopathic personality--	Included at own request.

Group IV

(1) Immature-----	Marked feelings of guilt over his theft of money which has not been reported to the police.
(2) Personality disorder-----	Feeling of rejection by his family and others. Born of Negro father and having Negroid features in himself, but does not wish to be identified as such.
(3) Inadequate, impulsive-----	Admits kleptomaniac tendencies since childhood; assistance requested.
(4) Immature-----	No statement.
(5) Immature, inadequate-----	Deep anxiety over welfare of wife and child, causing him much unrest.
(6) Personality disorder--	Other inmates are "out to get me."
(7) Personality disorder-----	Temper tantrums to point of hysteria.
(8) Dull, inadequate-----	Obsessed with masturbatory guilt feelings.

If we had had more therapists and more time, it would be desirable to divide the groups to even up the educational level and to keep good restoration risks together. We have not yet attempted to evaluate the individual's improvement and his general emotional and mental condition through projection measures, but plan to do so in future studies by means of the Rorschach test, Thematic Apperception Test, and other psychological devices.

EXPERIENCE WITH GROUP NO. 1

As noted previously, Group No. 1 was selected because they had appeared most frequently at sick call. This was also the group whose sessions were held after the usual working hours, that is 1500 to 1600 twice a week. None of these men had any definite physical disorder. Their complaints were obviously psychiatric, including four men who were suffering from mild skin rashes which were definitely psycho-

genic in origin and aggravation. From the beginning, this group showed a marked resistance to therapy as noted above. They did not want therapy on their own time. They felt that the other men were calling them "psycho" because they had to come and see the psychiatrist. The comments of these men obtained at individual interviews after the conclusion of 2 months of therapy are quoted verbatim in table 1.

EXPERIENCE WITH GROUP NO. 2

This was the group selected because the men had been most frequently on report. They displayed much resistance and suspicion during the early sessions. It was necessary to reiterate repeatedly the objectives of the meetings and give further assurance that their comments would be kept confidential and that they were free to relax and "talk out" anything on their minds. After the first few sessions they seemed fully at ease and receptive in their attitudes. All members participated freely in the discussions and with apparent interest. The majority of this group seemed more interested in their immediate needs and comforts during their confinement and less in problems related to general life adjustments. It was, therefore, frequently necessary to direct their attention to future goals.

The early sessions showed a tendency to degenerate into "gripe sessions." These were not discouraged at first because it was felt that this constituted good release of emotional tension. Many of their complaints were referable to their resentment of institutional routine. Prominent among their "gripes" were: (a) Why must duty personnel inquire repeatedly into my background, my sex habits and experience, nature of my offense, and so forth; (b) sentries here are too young and immature and do not handle us like men; they are too petty and report us for "looking cock-eyed;" (c) "scans" (homosexuals) eating with us, is disgusting; (d) our "chits" to see certain duty personnel for personal reasons are frequently returned to us for more details; and (e) the delay in receiving and sending mail is disturbing.

These "gripes" were all given consideration and where discrepancies were found, they were corrected. In a sense, this might be considered group therapy for all the inmates.

EXPERIENCE WITH GROUP NO. 3

Men included in group No. 3 were selected for participation after individual interviews in which it was felt by the psychiatrist that such therapy would be beneficial. A few men were included at their own request. The details of this group are shown in table 3. It is interesting to note that, although this is a rather heterogeneous group, from the standpoint of diagnosis, age, educational level, and interests,

group rapport was established early. Three members of this group suggested to the psychiatrist that certain of their friends needed therapy of this type and would benefit by it and asked that they be added to the group. This group has been functioning now for over 2 months and some of their sample reactions are indicated in table 3. An additional experimental situation was created with this group to determine whether or not an additional authoritative figure could be added without disturbing the group rapport. For this purpose the chaplain was selected. He has participated in eight discussions and although there was a slight restraint on the part of the group during the early part of the first session until they determined the part he was to play, he has been accepted as a member of the group and the discussion has returned to its former free level.

EXPERIENCE WITH GROUP NO. 4

Group No. 4, as already indicated, was also formed on the basis of individual interviews with each member. In table 5 are listed the particular problems which each one presented as very disturbing to him and which seemed to warrant therapeutic attention. In contrast to former groups, this group devoted most of its discussion to topics relating to mental hygiene. They concerned themselves with problems of institutional life only in their relation to their possible effects on their postrelease adjustments. Although only 12 sessions have been held to date, their interest and enthusiasm is evidenced by their lively participation and comments shown in table 4. They were asked to express their opinions frankly, and it is believed that their remarks are valid expressions of their real feelings and attitudes.

TOPICS FOR DISCUSSION

Among the topics chosen for discussion by group No. 1 were the following:

- (a) Being "psycho."
- (b) Relation of emotional disturbances to somatic symptoms.
- (c) What do you mean by personality disorder? How is that different from other disorders?
- (d) Does a man have control over his actions?
- (e) Difference between legal and moral guilt.
- (f) What is conscience? Some people don't seem to have one.
- (g) Clemency and Restoration Board. Who composes it? Why do they ask so many personal questions?
- (h) Naval justice. "There is none!"
- (i) Sublimation.
- (j) What is the difference between "queer" and "eccentric"?

(*k*) Orientation toward future goals.

(*l*) Egocentricity—narcissism.

The interests of group No. 2 were somewhat different. Topics which came up for discussion with this group included:

(*a*) Doing things impulsively, "flying off the handle" and feeling sorry afterward.

(*b*) Facing the family and friends after release; feeling ashamed and inferior. How can one overcome such feelings?

(*c*) Why do some people have more trouble in getting along than others? Do we inherit our peculiarities?

(*d*) Getting along with people—desirable and undesirable personality traits.

(*e*) Discovering our abilities and our weaknesses.

(*f*) How can we prevent marriage from "going on the rocks?"

Group Nos. 3 and 4 are following along the same line of discussion. Both of these groups, however, show less tendency to concentrate on their immediate "gripes" and will discuss future goals.

FUTURE CONSIDERATIONS

As we gain more experience in selection of men for the group and in handling the group itself, we feel that this effectiveness of group psychotherapy can be enhanced by the gradual addition of the following procedures: (*a*) Psychodrama; (*b*) assignment of reading material with group discussion; (*c*) assignment of topics for discussion by the group; (*d*) visual aids; and (*e*) the use of two or more therapists in each group.

CONCLUSIONS

On the basis of our experience to date, the following tentative conclusions seem warranted:

(*a*) The group should be composed of about 10 men. This is a good size to handle and does not take too many men away from work or involve too many appointments.

(*b*) Sessions should be conducted twice a week, be about 1 hour in length and continue for about 2 months. An adequate amount of material can be covered in this time and more men may have the benefit of this therapy.

(*c*) The sessions should be held during working hours.

(*d*) The group should be hand-picked, preferably during the initial psychiatric examination, with special consideration being given to the needs of the man and his suitability for group therapy.

(*e*) Equally important in selection is to suit the therapist to the patient. For this reason, it is of value to have more than one group.

(f) The active and semidirective approach appears to be the most effective.

(g) The presence of an additional authoritative figure did not seem to disturb the group rapport but rather enhanced it.

(h) A warm and informal atmosphere of the therapy room is essential for greater freedom and spontaneity of expression on the part of the group members.

(i) On the basis of this short trial period, it would seem that the men participating have benefited from this form of therapy. This is based on our subjective observations, the observation of supervisors (as indicated in work reports), decreased frequency of being on report or sick call, and the opinions of the men forming the group.

(j) Group therapy should be continued and its possibilities further explored within the naval disciplinary system.

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Psychiatric Rehabilitation

A Follow-Up Study of 200 Cases

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ON A designated ward at the United States Naval Hospital, St. Albans, N. Y., over 1,000 patients were treated by a balanced rehabilitation program including group psychotherapy during an 18 months' period from March 1944 to September 1945.

After the cessation of hostilities, the character of the cases admitted with psychiatric disabilities changed and the admissions included fewer so-called "combat fatigue" cases. At that time an optimistic opinion was held regarding the value of the rehabilitation program. It was felt, however, that a period of time should elapse, and a retrospective view should be taken with some statistics as to ultimate disposition of the cases. This might result in an entirely different opinion regarding its efficacy. Adequate follow-up studies in psychiatric cases are rare in the literature particularly as applied to combat induced neuroses. This study was undertaken to appraise rehabilitation in retrospect, and, incidentally, to evaluate group psychotherapy.

The follow-up information in 200 cases was obtained by letter. Personal interviews in over 20 cases resulted in a pattern of replies which corresponded closely with the information received in the questionnaires. Hence, the results are considered to have a relatively high degree of validity. The cases treated represented a selected group of men of various ages admitted with a psychiatric diagnosis of "combat fatigue," "operational fatigue," "psychoneurosis," or an undetermined diagnosis for mental observation. All the cases had had combat or harrowing experiences which were precipitating factors either in bringing on the neurosis or in aggravating an underlying personality defect. This report covers 200 cases selected at random from the group treated.

The diagnoses at the time of discharge from the hospital were:

TABLE 1

<i>Diagnosis</i>	<i>Number of cases</i>
Fatigue state:	
Combat fatigue.....	51
Operational fatigue.....	33
Total fatigue state.....	84
Psychoneurosis:	
Anxiety neurosis.....	43
Hysteria.....	8
Situational.....	7
Unclassified.....	10
Total, psychoneurosis.....	68
Personality disorders.....	24
No disease.....	11
Postconcussion syndrome.....	9
Other diagnoses.....	4
Total.....	48
Total number of cases.....	200

The patients admitted were those suffering from combat and service aggravated disabilities in varying degrees. The "fatigue state" diagnosis was given to the group of men for whom recovery was assumed probable and for whom a return to limited duty for a trial period was anticipated. "Combat fatigue" was reserved for that group which had undergone the most severe battle experiences and included the concomitant symptoms of insomnia, anorexia, nightmares, weight loss, noise sensitivity, and restlessness. "Operational fatigue" was the diagnosis used in the more chronic fatigue states where long, arduous sea duty was a factor, but minimal actual combat had been experienced. In this group, psychosomatic symptoms predominated.

The largest group of "psychoneuroses" were the "anxiety neuroses" in whom tenseness, anxiety, headaches, tremors, and depression were the predominant symptoms. The diagnosis "hysteria" was used for those with fainting, globus hystericus, paralyses, paresthesias, and other manifestations of major hysteria. The diagnosis of "situational neuroses" was applied to those cases where family problems or the difficulty of adjusting to shipboard or advanced base routine were the prominent features. The "unclassified psychoneuroses" were cases with various manifestations of a mixed neurosis.

The group diagnosed "postconcussion syndrome" had histories of blast, unconsciousness, abnormal electro-encephalograms, and whose psychometric examinations showed evidences of organic intellectual deterioration. Most of these cases manifested superimposed anxiety and hysterical reactions.

The cases diagnosed "personality disorder" were those with a long history of instability, inadequacy, or schizoid tendencies which had

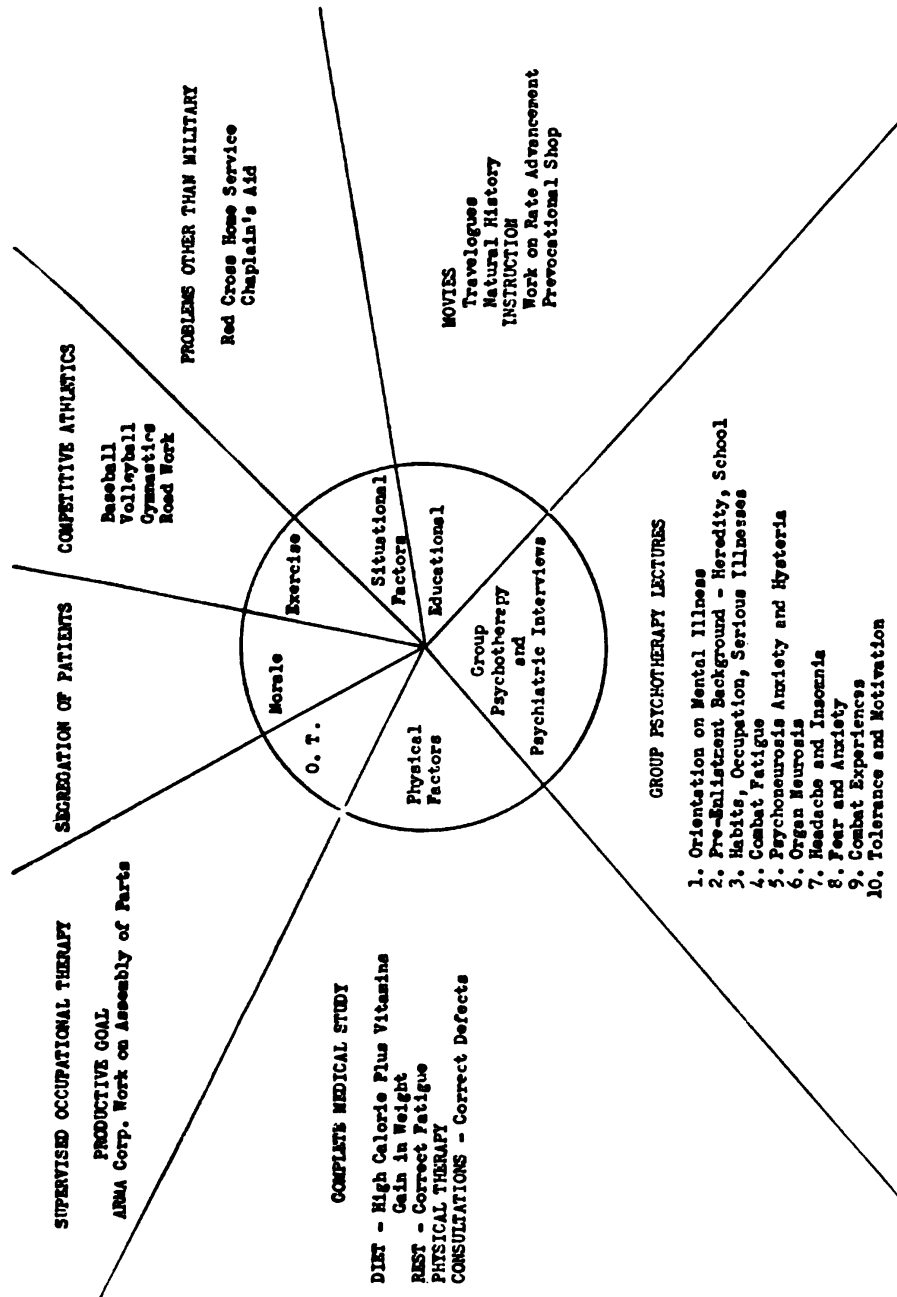


Figure 1.—Proportionate value of the various phases of the rehabilitation program.

been aggravated by service conditions. These cases were diagnosed in the longitudinal rather than in the cross-section view of the acute symptoms present while hospitalized. None of these cases were psychopaths in the criminal or antisocial sense, but were those with emotional lability, low intellectual endowments, or with family tendencies toward a schizoid personality.

The duration of treatment given these patients averaged 27 days. An over-all picture of the rehabilitation program is shown in figure 1.

Each patient received a complete medical work-up including roentgenograms and consultations with various specialists to rule out or correct all organic defects. Following this, all patients were given 2 weeks of psychotherapy, 1 hour per day. They were required to participate in an occupational therapy program. This work consisted of assembling electrical parts under the supervision of an occupational therapist. The physical rehabilitation officer directed the men in 1 hour of daily exercises in athletics, setting-up exercises, and occasionally in "road work." Active participation by all patients was noted. The educational program was another requirement and consisted of lectures, educational movies, travelogues, and quiz sessions. A special feature of this aspect of the therapy was the auditorium program once weekly by a well-known person on a current events topic. In addition to this, the men were required to assist in ward cleaning detail each day. A typical day in the program is here outlined.

Typical day of rehabilitation

0630	Reveille.	1130	Chow.
0700	Chow.	1300	Rest—Free time.
0800	Ward cleaning details.	1400	Athletics.
0845	Sick call.	1530	Educational services program.
0915	Section A—Group therapy session.	1700	Chow.
	Section B—Occupational therapy.	1900	Movies—Auditorium programs.
1015	Section A—Occupational therapy.		
	Section B—Group therapy session.		

The cooperation of the Red Cross, and the Chaplain Corps was of great value in promoting the group welfare. In addition, these activities did much to alleviate home, marital, and financial problems.

The actual psychotherapy carried out in each case consisted of the following: Each individual had 3 interviews and a physical examination by the ward medical officer. Supplementing this was a series of 10 discussions in which the group participated. The subjects of these discussions may be found in figure 1. It will be noted that these topics dealt with matters which were of vital concern to the individuals involved. In other words, an attempt was made to get the group

thinking intelligently and logically about matters of importance to themselves.

The benefit derived from the program may be attributed to the well-coordinated program of daily activities which was compulsory and the high morale maintained by the ward staff and patient personnel. In retrospect, it appears, that the "action" part of the program, namely athletics, was of greatest value. The part "speech" played was undoubtedly secondary, that is, the opportunity for voicing individual complaints and opinions. The least beneficial was the thinking stimulated by the lectures attended by the group.

In addition to the active therapy previously listed, special emphasis was placed on the nutritional aspect of mental illness. All organic diseases were ruled out or corrected, if present. As a result of a high calorie diet each member of the group showed definite weight gain. Every patient received 50 milligrams of nicotinic acid and 5 milligrams of thiamin chloride three times daily. All patients also received 1 cc. of liver extract (15 units/cc.) three times weekly for 2 weeks. Whether or not this was important in rehabilitation is difficult to ascertain, but in an unreported group of earlier cases, alternate patients were given the thiamine and nicotinic acid and at the end of 4 weeks there did appear to be a definite improvement in the treated cases as compared with the untreated ones. How much of this improvement was due entirely to suggestion is difficult to say, but we were so impressed by early results that it was made an integral part of each patient's treatment.

An over-all picture of the replies obtained from the questionnaires is given in table 2.

TABLE 2

	<i>Percent</i>
Able to adjust to civilian life.....	72.4
Required further hospital care.....	13.5
Receiving disability pension.....	61.2
Working at time of follow-up.....	81.8
Improvement noted by relatives.....	79.7
Patient Evaluation of Treatment:	
Excellent.....	60.5
Good.....	33.9
Poor.....	5.6

When all cases are considered it is found that if results are measured in terms of the man's own report of his ability to adjust to civil life and the reactions of his relatives, the picture is a satisfactory one. It is of interest to note that when the entire group was polled 94 per cent of the men felt that the treatment was either "excellent" or "good." This is indicative of the satisfactory reception of the program by the participants regardless of their ultimate disposition.

After treatment, the disposition of the 200 cases was: (a) Returned for a trial of limited shore duty, 113; and (b) discharged as unfit for naval service, 87. The present status of the 113 men returned to duty after treatment is: (a) Subsequently discharged, 94; and (b) still on active duty in the Navy, 19. The nature of the 94 "subsequent discharges" mentioned above were: (a) Administrative discharges, 45; and (b) medical disability discharges, 49. Included in the "Administrative discharges" were the men who were released on the basis of a critical point score, some before being returned to a full duty status. These men could have continued to serve had it been necessary. If we combine this group of 45 men with the 19 men still in service we have a total of 64 men to which we may refer as the "duty group." A comparison of the latter may be made with the men discharged (87 immediately after treatment; and 49 subsequently released) which totals 136 and which we call the "discharged group." The results obtained when the reports of these two groups are compared are shown in table 3.

TABLE 3

	Discharged group 136 men	Duty group
	<i>Percent</i>	<i>Percent</i>
Able to adjust to civilian life.....	67.1	88.1
Required further hospital care.....	17.5	4.7
Receiving disability pensions.....	83.3	8.3
Working at time of follow-up.....	80.8	82.8
Improvement noted by relatives.....	73.3	92.6
Patient evaluation of treatment:		
Excellent.....	53.0	60.5
Good.....	39.5	33.9
Poor.....	7.5	1.6

It will be noted that in the "duty group" a higher percentage reported they were able to adjust to civilian life and were working in civilian occupations or in the Navy. On the other hand, a much lower percentage had returned to hospitals for further care and a considerably smaller number were receiving disability pensions. Furthermore in this group 92.6 percent reported that their relatives had noticed improvement in their conditions after treatment, 94.4 percent of these men had rated the treatment as either excellent or good and only 1.6 percent considered it poor.

In table 4 we have sought to show in more detail the symptoms and follow-up information in a random sampling of 35 cases of combat fatigue, that is, those individuals with severe combat-induced disorders of relatively acute nature and with a minimum of pre-enlistment neurotic characteristics in their history. In this group, we note an average of 44.5 months of service prior to their hospitalization. Of the 35 cases, 6 required further hospitalization and 9 cases, or approximately 25 percent, are now in good health according to their present evalu-

TABLE 4.—*Summary of combat fatigue cases*

Case No.	Age	Months of service before treatment	Symptoms at time of admission	Months service after treatment	Receiving disability pension	Adjustment to civilian life	Working at time of follow-up	Improvement noted by relatives	Re-quired later hospitalization	Length of follow-up (months)	Present status
7	21	34	Anorexia, need for excessive sleep, fatigue	9		X	X	X		11	In good health.
9	25	48	Depressed, tearful, shaky, insomnia, bites nails.	9½	X	X	X	X		14	Still a little nervous and moody
13	19	18	Nervous, occasional headaches, annoyed by noise.	7	X	X		X		16	In good health.
14	27	22	Stomach trouble, occasional headache, trouble sleeping, nervous.	3		X	X			11	Still has stomach trouble, but health fair.
19	29	29	Sleeps poorly, good appetite, dreams of battle, tremors.	8		X	X	X		12	Still dreams occasionally.
21	24	41	Battle dreams, headache, nervous	5	X	X	X		X	12	General health fair. Treatment not long enough.
22	23	32	Tense, nervous	10		X		X		12	Poor health. Lost 40 pounds.
24	20	22	Nervous, restless, insomnia	8		X	X	X		11	In good health.
25	29	126	Stomach upset, insomnia, anxiety, mild euphoria.	12		X	X			12	Health fair.
30	21	38	Dizzy spells, no energy, inadequate type of artistic temperament.	14	X					12	In good health.
35	21	18	Nervous, stomach upset, insomnia, anorexia	12				X		24	Feels let down. Lacks nervous energy.
38	19	25	Stomach pains, lack of appetite	12		X		X		15	Rheumatic fever, but psychiatrically well.
39	37	240	Nervous, anorexia, restless, pains in neck	19		X	X	X		17	Headaches, but health fair.
43	21	44	Insomnia, nail biting	0	X		X	X		19	Fine for one year. Now tremor.
47	24	26	Nightmares, back pains, emotional instability marked, malaria	0	X		X	X		21	Rundown. Health poor.
54	22	28	Nervous, startle reaction, insomnia	17	X	X	X	X		20	In good health.
73	20	30	Nervous, nightmares, dreams, poor appetite, headaches	6	X	X	X	X	X	12	Attending school and in fair health.
77	22	32	Headaches, nervous, tremors, insomnia, restless.	5	X			X	X	13	Health fair.
78	34	14	Nervous, worry	5		X		X	X	14	"Treatment swell." Health fair.
80	21	28	Nervous, depressed, shaky	8	X	X	X			12	Health fair.
105	20	21	Jumpy, nervous, wanted rest, severe fatigue	17		X	X	X		24	Nervous at times, but in good health.
106	33	32	Stomach and bowel trouble, insomnia, irritable, anorexia	11	X		X			15	Sweating, battle dreams.
107	20	43	Nervous, irritable, battle dreams	11	X	X	X			18	Health fair.

¹ Still on active duty.

TABLE 4.—Summary of combat fatigue cases—Continued

Case No.	Age	Months of service before treatment	Symptoms at time of admission	Months service after treatment	Receiving disability pension	Adjustment to civilian life	Working at time of follow-up	Improvement noted by relatives	Required later hospitalization	Length of follow-up (months)	Present status
109	39	20	Insomnia, weight loss, anorexia, pneumonia while at hospital.	8	X	X	X			24	"My case not understood."
110	24	52	Shoulder, elbow, and knee pain, tense, hysterical manifestations.	0	X	X	X			14	Health poor.
123	22	18	Nervous, anxious, tremulous	7	X	X	X	X		22	Do.
125	22	21	Nervous, noise sensitivity, dreams, inability to stand watches.	12		X	X	X		19	In good health.
128	26	33	Nervous, headaches, dizzy, restless, moody, stomach upset.	6	X	X	X		X	18	Do.
129	22	28	Shaky, weepy, noise sensitivity, depressed	12	X		X			18	Health fair.
136	25	72	Backaches, headaches, nightmares, can't relax, trauma in battle.	11			X	X	X	18	Still nightmares. Awakens frightened. Health poor.
147	41	17	Nervous, insomnia, weakness	10			X	X		24	Still headaches. Noise sensitivity. Health fair.
178	27	120	Nervous, pain in left chest	19			X	X		19	In good health.
186	23	43	Nervous, irritable, tense	0	X	X	X	X		12	Nervous, stomach trouble.
187	25	117	No complaints on admission here. Previously insomnia, irritability, battle dreams, tremors.	127		X	X	X		27	Health fair.
190	20	24	Shaky, not eating	5	X					22	Do.
24.8		244.5		9.3	19	25	28	23	6	16.9	

2 Average.

ation of their cases while 15 consider their health only fair at present. Only 4 of the group consider their health poor at this time. It is interesting to note that over 50 percent of this group are now receiving pensions, while over 75 percent of them are working. On the whole the results would appear to be satisfactory for those cases classified as "combat fatigue."

In table 5 we have selected at random 20 cases of "operational fatigue," a group whose service average 46.7 months. For the most part these individuals were subjected to a minimum of combat, but were compelled to undergo duty of a tedious and exhausting nature. They were chronic psychoneurotics with more stable backgrounds and they were, in general, able to stand more before developing their symptoms. Of these cases, we find that 14 considered their health good at the time of the study. The remainder felt their health to be only fair. Ninety percent of these men are working now and only 20 percent are drawing disability pensions. Only 2 required further hospitalization. From these results it would appear the more stable the individual and the more chronic the fatigue in production of the nervousness, the better the prognosis.

In table 6 an unselected group of psychoneurotics was analyzed in detail. Many of these had pre-enlistment evidence of neurotic traits which were aggravated by service conditions. Omitting the 2 cases with very long service time the remainder averaged 27.5 months of service prior to hospitalization. One of the patients later became psychotic. Only 4 required later hospitalization. Eleven still complain of various symptoms. Of the 20 cases of psychoneurosis, 85 percent are now receiving pensions. Interestingly enough, 85 percent are working at present, but only 3 in the group concede that their health is now good. The impression gained from their comments was that, while they still had most of their original symptoms, they were able to adjust more satisfactorily to their work now than before treatment.

TABLE 5.—Summary of cases of operational fatigue

Case No.	Age	Months of service before treatment	Symptoms at time of admission	Months service after treatment	Receiving disability pension	Adjustment to civilian life	Working at time of follow-up	Improvement noted by relatives	Required later hospitalization	Length of follow-up (months)	Present status
20	41	35	Nauseated, weakness, sweating, headaches, back pain.	7			X	X		12	In good health.
23	33	32	Restless, stomach pain, shaky.	7		X	X	X		10	Do.
27	20	27	Tired, ambitionless, apathetic, emotional instability.	12	X		X	X		19	Restless, moody, headaches. Health fair.
48	28	74	Nervous, irritable, insomnia, no appetite, headaches.	12		X	X	X		19	In good health.
53	46	20	Tired, pains back, neck, shoulder, legs weak.	22		X	X	X	X	22	Health fair.
60	36	24	Nervous, weak, insomnia.	9		X	X	X		14	In good health.
63	27	40	Headaches, pains in top of head and neck. Trouble with officers. Nervous.	7		X	X			12	Do.
70	25	34	Nervous, stomach bad, anemic.	2	X	X	X			12	Health fair.
71	20	29	Nervous, trouble sleeping, gets sick after walking and lifting.	1½	X	X				12	Still has symptoms, but not as often. Health fair.
75	36	36	Tired, joint pains.	4	X	X	X			12	Health fair.
83	21	49	Irritable, headaches, insomnia.	7		X	X	X	X	12	In good health. Successful in business.
84	19	18	Headaches, nightmares, nervous, immature and unstable.	7		X	X	X		12	Still has headaches. Health fair.
112	32	17	Nervous, insomnia, anorexia.	120		X	X			20	In good health.
119	48	61	Tremulous, anxious, can't eat.	12		X	X	X		21	Do.
139	39	221	Pains in arms and legs.	125		X	X	X		25	Do.
171	26	51	Dizzy spells, stomach trouble, restless.	2		X	X			15	Do.
173	36	79	Dizzy spells, stomach trouble, restless.	10		X	X	X		17	Do.
175	24	18	Nightmares, hands sweat, worry.	8		X	X	X		13	Do.
197	42	29	Stomach difficulty, pains in teeth, insomnia, anorexia, readmission.	6		X	X			13	Do.
199	22	40	Nervous, insomnia, irritable.	13		X	X			13	Do.
	31.05	46.7		9.65	4	18	18	12	2	15.2	

1 Still on active duty.

2 Average.

TABLE 6.—Summary of cases of psychoneurosis

Case No.	Age	Months of service before treatment	Symptoms at time of admission	Months service after treatment	Receiving disability pension	Adjustment to civilian life	Working at time of follow-up	Improvement noted by relatives	Re-quired later hospitalization	Length of follow-up (months)	Present status
1	22	52	Psychoneurosis, unclassified. Nervous, shaky, headaches, poor appetite, ringing in ears.	0	X	X				9	Required medication later for "nerves."
4	28	110	Psychoneurosis, situational. Headaches, insomnia, worry, wife pregnant.	1 27		X	X	X		27	In good health. Perfectly well.
5	24	31	Psychoneurosis, anxiety. Nervous, no sleep, stomach trouble, ship sunk, gave acute anxiety.	0	X		X	X		12	Still nightmares, noise sensitive.
8	23	44	Psychoneurosis anxiety. Foot trouble, insomnia, headache, very nervous.	0	X				X	10	Mentally ill in Vet's Hospital. Psychotic.
11	38	11	Psychoneurosis, anxiety. Tense, depressed, anxious, obsessive idea re fire, ship sunk.	0	X	X	X	X		12	Sleepless, dreams, screams while sleeping, moody.
12	22	50	Psychoneurosis, anxiety. Nervous, irritable, fearful, always anxious, battle-aggravated.	0	X		X			9	Insomnia, no appetite, dreams, nervous.
29	18	30	Psychoneurosis, anxiety. Anorexia, weight loss, dizzy, headaches, visual disturbances.	8	X		X		X	21	Health same as on admission.
31	36	24	Psychoneurosis, anxiety. Nervous, stomach pains, loss of appetite, insomnia.	9	X	X	X	X		24	Health fair.
33	21	22	Psychoneurosis, anxiety. Tense, tremulous, leg sensation, restless.	0	X	X	X	X		20	Limbs still bother him. Health fair.
34	27	19	Psychoneurosis, hysteria. Fainting spells, headaches, inadequate type.	0	X		X	X		22	Still has back trouble, but in good health.
36	39	25	Psychoneurosis, situational. Tense, anxious, depressed, legs bother him, cramps.	12	X	X	X			19	Health fair.
37	23	44	Psychoneurosis, mixed. Pain over left ear, headache, tremulous, sweaty hands.	0	X	X	X	X		22	Still pains in ear, hyperhidrosis. In fair health.
41	22	30	Psychoneurosis, anxiety. Irritable, tense, unstable emotionally.	0	X	X	X	X		20	In good health.
42	22	14	Psychoneurosis, anxiety. Nervous, heart pain, insomnia, anorexia, irritable, inadequate.	11	X	X	X	X		21	Noise gives headaches. Treatment helped. Health fair.
65	52	314	Psychoneurosis, situational. Nervous, excessive sea duty, family difficulties.	17		X	X	X		27	In good health.
108	23	25	Psychoneurosis, anxiety. Pains left leg, ringing in ears, lumpy, leg wounds.	0	X	X	X			17	Health fair.
121	29	22	Psychoneurosis, anxiety. Headaches, insomnia, nervous.	0	X		X	X		20	Still nervous. Health fair.

1 Still on active duty.

TABLE 5.—Summary of cases of operational fatigue

Case No.	Age	Months of service before treatment	Symptoms at time of admission	Months service after treatment	Receiving disability pension	Adjustment to civilian life	Working at time of follow-up	Improvement noted by relatives	Required later hospitalization	Length of follow-up (months)	Present status
20	41	35	Nauseated, weakness, sweating, headaches, back pain.	7			X	X		12	In good health.
23	33	32	Restless, stomach pain, shaky	7		X	X	X		10	Do.
27	20	27	Tired, ambitionless, apathetic, emotional instability.	12	X		X	X		19	Restless, moody, headaches. Health fair.
48	28	74	Nervous, irritable, insomnia, no appetite, headaches.	12		X	X	X		19	In good health.
53	46	20	Tired, pains back, neck, shoulder, legs weak.	22		X	X	X	X	22	Health fair.
60	36	36	Nervous, weak, insomnia.	9		X	X	X		14	In good health.
63	27	40	Headaches, pains in top of head and neck. Trouble with officers. Nervous.	7		X	X			12	Do.
70	25	34	Nervous, stomach bad, anemic.	2	X	X	X			12	Health fair.
71	20	29	Nervous, trouble sleeping, gets sick after walking and lifting.	1½	X	X				12	Still has symptoms, but not as often. Health fair.
75	36	36	Tired, joint pains	4	X	X	X			12	Health fair.
83	21	49	Irritable, headaches, insomnia.	7		X	X	X	X	12	In good health. Successful in business.
84	19	18	Headaches, nightmares, nervous, immature and unstable.	7		X	X	X		12	Still has headaches. Health fair.
112	32	17	Nervous, insomnia, anorexia.	120		X	X			20	In good health.
119	46	61	Tremulous, anxious, can't eat.	12		X	X	X		21	Do.
139	39	221	Pains in arms and legs.	125		X	X	X		25	Do.
171	26	51	Dizzy spells, stomach trouble, restless.	2		X	X			15	Do.
172	36	79	Dizzy spells, stomach trouble, restless.	10		X	X	X		17	Do.
175	24	18	Nightmares, hands sweat, worry.	8		X	X	X		13	Do.
197	42	29	Stomach difficulty, pains in teeth, insomnia, anorexia, readmission.	6		X	X			13	Do.
199	22	40	Nervous, insomnia, irritable.	113		X	X			13	Do.
	31.05	46.7		9.65	4	18	18	12	2	15.2	

1 Still on active duty.

2 Average.

TABLE 8.—Summary of cases of psychoneurosis

Case No.	Age	Months of service before treatment	Symptoms at time of admission	Months service after treatment	Receiving disability pension	Adjustment to civilian life	Working at time of follow-up	Improvement noted by relatives	Re-quired later hospitalization	Length of follow-up (months)	Present status
1	22	52	Psychoneurosis, unclassified. Nervous, shaky, headaches, poor appetite, ringing in ears.	0	X	X				9	Required medication later for "nerves."
4	28	110	Psychoneurosis, situational. Headaches, insomnia, worry, wife pregnant.	1 27		X	X	X		27	In good health. Perfectly well.
5	24	31	Psychoneurosis, anxiety. Nervous, no sleep, stomach trouble, ship sunk, gave acute anxiety.	0	X		X	X		12	Still nightmares, noise sensitive.
8	23	44	Psychoneurosis anxiety. Foot trouble, insomnia, headache, very nervous.	0	X				X	10	Mentally ill in Vet's Hospital. Psychotic.
11	38	11	Psychoneurosis, anxiety. Tense, depressed, anxious, obsessive idea re fire, ship sunk.	0	X	X	X	X		12	Sleepless, dreams, screams while sleeping, moody.
12	22	50	Psychoneurosis, anxiety. Nervous, irritable, fearful, always anxious, battle-aggravated.	0	X		X			9	Insomnia, no appetite, dreams, nervous.
29	18	30	Psychoneurosis, anxiety. Anorexia, weight loss, dizzy, headaches, visual disturbances.	8	X		X		X	21	Health same as on admission.
31	36	24	Psychoneurosis, anxiety. Nervous, stomach pains, loss of appetite, insomnia.	9	X	X	X	X		24	Health fair.
33	21	22	Psychoneurosis, anxiety. Tense, tremulous, leg sensation, restless.	0	X	X	X	X		20	Limbs still bother him. Health fair.
34	27	19	Psychoneurosis, hysteria. Fainting spells, headaches, inadequate type.	0	X		X	X		22	Still has back trouble, but in good health.
36	39	25	Psychoneurosis, situational. Tense, anxious, depressed, legs bother him, cramps.	12	X	X	X			19	Health fair.
37	23	44	Psychoneurosis, mixed. Pain over left ear, headache, tremulous, sweaty hands.	0	X	X	X	X		22	Still pains in ear, hyperhidrosis. In fair health.
41	22	30	Psychoneurosis, anxiety. Irritable, tense, unstable emotionally.	0	X	X	X	X		20	In good health.
42	22	14	Psychoneurosis, anxiety. Nervous, heart pain, insomnia, anorexia, irritable, inadequate.	11	X	X	X	X		21	Noise gives headaches. Treatment helped. Health fair.
65	52	314	Psychoneurosis, situational. Nervous, excessive sea duty, family difficulties.	17		X	X	X		27	In good health.
108	23	25	Psychoneurosis, anxiety. Pains left leg, ringing in ears, jumpy, leg wounds.	0	X	X	X			17	Health fair.
121	29	22	Psychoneurosis, anxiety. Headaches, insomnia, nervous.	0	X		X	X		20	Still nervous. Health fair.

1 Still on active duty.

TABLE 6.—*Summary of cases of psychoneurosis—Continued*

Case No.	Age	Months of service before treatment	Symptoms at time of admission	Months service after treatment	Receiving disability pension	Adjustment to civilian life	Working at time of follow-up	Improvement noted by relatives	Re-quired later hospitalization	Length of follow-up (months)	Present status
138	37	16	Psychoneurosis, anxiety.	12	X			X	X	27	Health poor.
140	37	22	Psychoneurosis, anxiety. Anxious, fatigued, depressed.	123		X	X	X		23	In good health.
193	32	16	Psychoneurosis, hysteria. Constriction at throat, palms perspire, poor sleeping.	0	X	X	X	X	X	15	Health fair.
	28.7	16.05		25.95	17	13	17	14	4	18.8	

1 Still on active duty.

2 Average.

TABLE 7.—*Summary of cases of personality disorders*

C. P. S.-I. P.—Constitutional psychopathic state, inadequate personality; C. P. S.-E. I.—constitutional psychopathic state, emotional instability; C. P. S.-schizoid.—constitutional psychopathic state, schizoid personality.]

Case No.	Age	Months of service before treatment	Symptoms at time of admission	Months service after treatment	Receiving disability pension	Adjustment to civilian life	Working at time of follow-up	Improvement noted by relatives	Re-quired later hospitalization	Length of follow-up (months)	Present status
2	22	21	Nerves bad, knee aches, life long inadequate.	0	X	X	X	X		10	Still has shaky spells. Weight loss, knee trouble.
3	24	36	Stomachache, headache, insomnia, long emotional instability. C. P. S.-E. I.	0	X			X		10	Still nervous, stomach and head pains.
6	25	33	Nervous, insomnia, depressions, headaches, long history. C. P. S.-schizoid.	0			X			11	Introspective re minor fungus infection on hands.
32	23	8	C. P. S. schizoid. Nervous, headaches, appears in good shape.	0		X		X		22	Health fair.
40	34	9	C. P. S.-I. P. Loss of appetite, stomach pains, tense, upset, low I. Q.	0			X	X		14	Feels the same. Joint pains.
44	24	27	C. P. S.-I. P. Nervous, crying, restless, beaved lips and muls.	0		X	X	X		14	Health fair.
52	19	20	C. P. S.-E. I. Vomiting, headaches, anorexia, sweating, dreams, insomnia.	0		X	X	X		16	Still restless. Health fair.
64	23	40	Eczema, nervous, insomnia. C. P. S.-I. P.	0		X	X	X	X	11	Losing weight. Health poor. Nerves still bother him. Health fair.

66	20	33	AOL when admitted. Nervous, fear of returning to ship, restless. C. P. S.-E. I.	0	X	X	X	X	11	Health fair.
67	30	21	C. P. S.-I. P. Nervous, anorexia, afraid of closed places, loss of appetite.	0		X	X	X	11	Do.
69	22	27	C. P. S.-I. P. Nervous, vomiting, inability to carry on duties, inadequate type.	0		X	X	X	12	Nerves about the same. Health fair.
74	32	37	Nervous, vomiting, insomnia, weak spells. C. P. S.-E. I.	0	X	X	X	X	12	Health fair.
76	25	64	Vague stomach pains, insomnia, headaches. C. P. S.-I. P.	0	X				12	Still insomnia. Health fair.
82	29	19	C. P. S.-I. P. Pains in legs, can't sleep, back pains, inadequate type.	0		X	X	X	13	Legs still bother him. Health fair.
86	19	26	C. P. S.-E. I. Admitted AWOL from ship, fearful, tense, apprehensive, restless.	0	X	X	X	X	12	In good health.
102	18	21	C. P. S.-E. I. Heart burn, headaches, eating poorly.	0		X	X	X	20	Health fair.
118	35	8	C. P. S.-I. P. Nervous, loss of weight, noise sensitivity, chest pain.	0		X	X	X	24	In good health.
166	26	27	C. P. S.-I. P. Nervous, fatigue, sweating, myasthenia, smothering spells.	0	X	X	X	X	15	Health fair.
177	29	34	C. P. S.-E. I. Weakness, diarrhea, tense.	0	X	X	X	X	18	Bowel trouble still. Health fair.
191	20	37	C. P. S.-E. I. Lost feeling, erratic, restless.	12		X			24	Health fair.
	124.9	127.4		10.6	8	16	17	14	114.6	

1 Average.

TABLE 8.—Summary of cases of post-concussion syndrome

Case No.	Age	Months of service before treatment	Symptoms at time of admission	Months service after treatment	Receiving disability pension	Adjustment to civilian life	Working at time of follow-up	Improvement noted by relatives	Re-quired later hospitalization	Length of follow-up (months)	Present status
62	22	47	Headaches, insomnia, amnesia	0	X	X	X	X		11	Health fair.
111	21	23	Headaches, nervous, vague body sensations, anorexia, visual disturbance.	0	X	X	X			16	Has headaches and dizzy spells, but in fair health.
130	23	36	Nervous, war dreams, headaches, sensitivity noise.	0			X			16	Health fair.
152	22	46	Nervous, insomnia, battle dreams, heart complaints.	0	X		X			22	Health fair.
200	25	47	Lethargic, headaches, legs ache, insomnia, stomach pains.	0	X	X		X	X	19	Health fair.
	122.5	139.8		0	4	3	4	2	1	116.8	

1 Average.

In table 7 the "personality disorders" are reviewed. Among this group we found shorter service prior to hospitalization and a surprisingly good end result in civilian life adjustment. Here 85 percent are working at present and only 40 percent are receiving pensions. Only one case required further hospitalization. From these results, it would appear that the personality defects are more compatible with civil life adjustment than with the demands of military service. It is doubtful if the treatment helped any of them since 85 percent believe their health only fair at present.

In table 8 we reviewed those individuals in whom there was concrete evidence of organic brain damage usually the result of concussion. The results are as expected in that they are only in fair health at present, although four out of five of them are working. The average follow-up of 16.8 months is inadequate to definitely determine what the future holds for this group of men.

Many interesting comments were obtained in the follow-up replies. The most common one requested special aid or assistance in receiving a high pension payment. The following response, received from a former operational fatigue case, is an illustration of the most common type of comment:

"I still have headaches, but they are few and far between. My nervousness is a little better, but I get nervous and distempered easily at my family when upset. I went over for a physical examination about my condition which occurred in the Navy. I have been dropping off in weight lately so the doctor gave me some vitamin B complex tablets to take which has increased my appetite. Do you think I should be drawing a pension?"

From a former combat fatigue case the following typical comment was received:

"At present I am drawing disability. As to my present mental and physical condition and status, I am having a very hard time readjusting myself to civilian life. I can go along fine on a job for a period of time, a week or 10 days or so, then suddenly I break down.

"I get extremely nervous, and have spells of cold sweats on face or forehead, and my hands sweat continuously. I blow my top, so to speak, read people off, thoroughly, and so very completely disgusted with myself and everyone near me. I feel very lonely and blue and I wish I was back out at sea where peace, peace and quiet somewhere, some far off distant place, like it was out at sea (it was that way to me, even under combat conditions).

"I live and relive over and over again battles I've been through in my mind's eye; it just comes to me anytime, anywhere (even in crowded streets, in rush periods in downtown traffic) I try to shake it off, but they (the dreams and dreams of battles) keep coming back. I get weak and light-headed sometimes during these scenes. I dream also of all these things in my sleep awakened suddenly at times yelling and crying. I can't seem to forget. I have blown up on the job at the post office. If it wasn't for understanding supervisors, who were vets of World War I, I'd been discharged long ago. Sorry I couldn't have done better. I am still trying."

Among those returned to duty we found that, on the whole, their comments were encouraging insofar as they remained in good health and, for the most part, seemed to have benefited from the treatment. One comment which was particularly well-spoken follows:

"My present condition is satisfactory. There was a quick and marked change when I re-entered civilian life. It was an enormous sense of relief—especially from the unbearable regimentation and petty routine of Navy life. I believe, as far as my own case is concerned, that the prolonged regimentation (over 3 years) was primarily the cause of my psychiatric condition. Secondly, but perhaps equally important, was the fact that I felt my full capacities and abilities were not being used; I was working far beneath my capabilities. This did not affect me in any 'social sense,' but more intellectually leading perhaps to an oppressive sense of frustration.

"There has been no 'problem' of adjustment to civilian life. Only one thing: I still experience a similar impatience and 'nervous energy' I felt while in the Navy. But in civilian life I am able to find suitable and satisfying outlets. While in the Navy there were no such outlets available; the energy merely accumulated, reached a saturation point, and the resultant combustion became my 'case.' I have concluded that I shall always be possessed with that excess 'nervous energy.' However, as a civilian I can put it to constructive use. In the Navy I could not and hence the 'breakdown.'"

The chief value of the program would appear to be salvaging a certain percentage of the men for further useful duty. In this series, we found that 55 percent were returned to limited duty, approximately 10 percent returned to full duty and are able to carry out their duties satisfactorily. Interestingly enough, an average of 80 percent of each group is working at the present time. Personal evaluation of the program was poorer in the discharged group than in the duty group.

CONCLUSIONS

1. Of the 200 cases reported in this follow-up study, 19 men are still on active duty in the Navy and an additional 123 men are making an adequate civilian life adjustment.

2. Further hospitalization was required in only 27 cases for further psychiatric care.

3. Of the entire group, 117 are receiving disability pensions.

4. One hundred and sixty-two men treated were working at the time of the follow-up.

5. Improvement was noted by relatives of 130 of the 163 men who responded.

6. The patients themselves evaluated the treatment as follows: Excellent, 118; good, 66; and poor, 11.

7. Of the 113 men given a trial of limited duty 57 percent are now receiving pensions while of 87 cases discharged after treatment, 77 percent are receiving pensions.

Urinary Extravasation Proximal to the Triangular Ligament

A Method of Repair

J. TATE MASON, *Commander (MC) U. S. N. R.*

RIGDON K. RATLIFF, *M. D.*

THE CAUSE of urinary extravasation in the majority of cases is traumatic. Bacon (1) in 1943 reported 147 cases, 70 percent of which were caused by external violence. Twenty-seven percent followed transurethral manipulation and 3 percent were spontaneous. Genito-urinary complications following external violence may be more common than is generally realized in light of the fact that such complications are reported in from 5 to 40 percent of patients having fractures of the pelvis (2) (3) (4) (5).

Transurethral manipulation is probably a greater cause of extravasation of urine than is generally reported. Fortunately, however, this is a rare complication of transurethral prostatic resection. In the early days of transurethral prostatic resection, one author (1) reported an incidence of 1.4 percent of extravasation. Two cases of urinary extravasation following transurethral prostatic resection have been reported in the past 10 years at the University of Michigan Hospital. Extravasation in both cases was extraperitoneal and above the triangular ligament. One patient died because of delay in recognizing the condition and in instituting proper treatment. Extravasation in the other patient was recognized and treated promptly, and he recovered.

Spontaneous, or the misnamed, idiopathic rupture of the bladder, which accounts for from 3 to 4 percent of the cases of urinary extravasation, is secondary to several predisposing factors, the most important of which is over-distention of the bladder following alcoholism, long-standing prostatism, tabes dorsalis, or stricture of the urethra. Final rupture of a thin-walled atonic bladder or possibly of a diverticulum (6) (7) may occur in these instances. Spontaneous extravasation through a diseased portion of the bladder wall with or without distention is seen on occasions. The underlying disease is usually a tumor, and when extravasation occurs, it may be impossible

to demonstrate the exact site of extravasation at operation. One such case occurred recently at the University of Michigan Hospital.

Extravasation proximal to the triangular ligament can be either extraperitoneal or intraperitoneal. For purposes of discussion the intrapelvic extravasations described by other writers shall be considered as extraperitoneal. Culp (8) reported 11 cases of combined extra and intraperitoneal rupture, but these are the exception.

No definite correlation between the injury and the type of extravasation exists. However, it is a fact that the empty flat bladder is well-protected and is rarely injured; the partially full or full bladder is often injured (9) and likely to rupture intraperitoneally. This accounts for the greater incidence of intraperitoneal ruptures in traumatic cases (1) (5) (10).

The mortality in intraperitoneal rupture is high. In most series of cases of urinary extravasation it is approximately 50 percent (1) (3) (11) (12) (13). The rate increases when there is a delay in operative intervention (14) (15). Stirling (13) states that he has reduced the mortality rate from 88.7 percent to 40 percent by early diagnosis and appropriate treatment. McCague and Semans (3) report a reduction of mortality from 78 percent to 23 percent and credit this to:

1. Early and accurate diagnosis.
2. Adequate treatment of shock.
3. Provision of adequate urinary drainage.
4. Surgical drainage of traumatized tissue.
5. Immobilization of the pelvis.

The symptoms of a patient having extravasation of urine may be masked by multiple injuries, by shock, or by inebriation. All patients with pelvic fractures should be suspected of having urinary tract injury until proved otherwise. An immediate microscopic examination of the urine is indicated in all cases. The importance of this simple examination cannot be overemphasized. Catheterization may be necessary. Although hematuria is present in about 30 percent of all patients with pelvic fractures (2) (16), only about one-third of those with hematuria have demonstrable urinary tract injury; however, the hematuria focuses attention on the genito-urinary tract, and treatment of this secondary though more important condition can be promptly instituted. A properly immobilized pelvis or long bone will not cause further injury and definitive treatment of fractures can be delayed until shock is controlled. However, to withhold immediate surgical intervention of a proved urinary extravasation is to invite disaster.

When there is a history of injury and the patient has been unable to void since that injury, urinary extravasation should be suspected.

Finding gross blood in the urine and associated diffuse abdominal tenderness, usually confirms the diagnosis. Shock may or may not be evident.

When urinary extravasation occurs during transurethral manipulation or at transurethral resection of the prostate, the diagnosis is generally self-evident if the patient is under a spinal or local anesthetic. The severity of symptoms will, of course, depend on the volume of fluid injected into the intra- or extra-peritoneal space (17) (18). Sudden severe abdominal pain and possibly subdiaphragmatic pain in a patient who had been relatively comfortable during a transurethral procedure, is pathognomonic of urinary extravasation. Shock may supervene in a very short time.

Unfortunately, all patients with extravasation do not present immediate symptoms (19). This is especially true during transurethral prostatic resection where a rent may be made in the prostatic capsule and symptoms of extravasation may prevent themselves in the form of pelvic cellulitis several days later. In all cases where the prostatic capsule has been perforated the patient should be carefully watched for signs and symptoms of sepsis and if this occurs, proper therapy must be instituted at once.

In some cases of urinary extravasation the diagnosis can be made from the history and physical findings alone. In these cases no laboratory procedures other than a urine examination and routine blood tests are necessary and none need be carried out. In most cases, however, the diagnosis is not evident from the history and physical findings alone, and certain laboratory procedures must be done. The cystogram or intravenous pyelogram are the procedures best suited for diagnosis in suspected extravasation (1) (5) (9) (16) (20) (21). The cystogram is preferable because it is faster and a greater concentration of the contrast media (12½ percent sodium iodide or Diodrast) is obtained in the bladder. Furthermore, it can be done without moving the patient from his bed or stretcher, a feat almost impossible with intravenous pyelography. Cystography, however, does entail the added risk of catheterizing the patient.

Other methods of establishing a diagnosis are:

(a) Instillation of a measured amount of solution into the bladder and withdrawal of an equal amount indicating no extravasation (23). This method is subject to several obvious inaccuracies and is not recommended when used alone, however, combined with cystography, it serves a useful purpose.

(b) Cystoscopic examination is not recommended and is difficult to do in a severely injured patient. Visualization may be poor because of hematuria and inability to distend the bladder. If the cystogram

does not reveal an extravasation and bleeding continues, intravenous pyelography is indicated to localize the bleeding site; cystoscopy is used only as the last resort.

(c) Injection of air into the bladder followed by roentgenograms (air cystogram). Upright films are taken and air, which has been injected into the bladder, is searched for under the diaphragm. This method is not dependable and the possibility of an air embolus makes it an extremely hazardous procedure (22).

The treatment of proved extravasation of urine, either extra or intraperitoneal, is immediate surgical intervention to provide adequate urinary drainage, drainage of traumatized soft tissue, and exploration of the peritoneal cavity if indicated.

Unless there are signs of intra-abdominal injury it is not necessary (and perhaps unwise) to open the peritoneum especially in cases of extraperitoneal extravasation. It is always opened when intraperitoneal extravasation is proved.

The low abdominal transverse incision has not been found practical for this purpose. A midline incision is used. Upon opening the abdominal wall, being careful not to open the peritoneum, the type of rupture is ascertained. If the rupture is extraperitoneal it is immediately evident by the presence of fluid in the vesical space. In all cases the bladder is opened before proceeding to the peritoneal cavity. When an intraperitoneal rupture is demonstrated, the bladder and overlying peritoneum are opened simultaneously through an incision from the vertex of the bladder to the points of peritoneal and bladder perforation (fig. 1). The abdomen is then explored and upon completion of any intraperitoneal surgical procedures indicated, the peritoneum is sutured separately from within outward with a continuous suture of No. 00 plain catgut. No drains are left in the peritoneal cavity. The bladder is sutured with interrupted sutures of No. 0 plain catgut from the inferior angle of the incision to the apex, a de Pezzer cystotomy catheter being left in the bladder (fig. 2). This method of exposing the bladder and peritoneal rents simultaneously (previously described by Ratliff and Isaacson (27)) makes repair simple and positive.

When, at operation, an extraperitoneal extravasation is found, cystotomy is carried out, care being taken not to open the peritoneum unless indicated. If the bladder wound is evident, it is closed with interrupted sutures of No. 0 plain catgut in situ with a cystotomy tube left in place. Extraperitoneal wounds may occur in the anterior surface of the bladder or possibly in the trigonal area, as neither place is covered with peritoneum. However, the most frequent place for extraperitoneal extravasation to occur is at the membrano-prostatic junction of the urethra; rupture may be complete or incomplete.

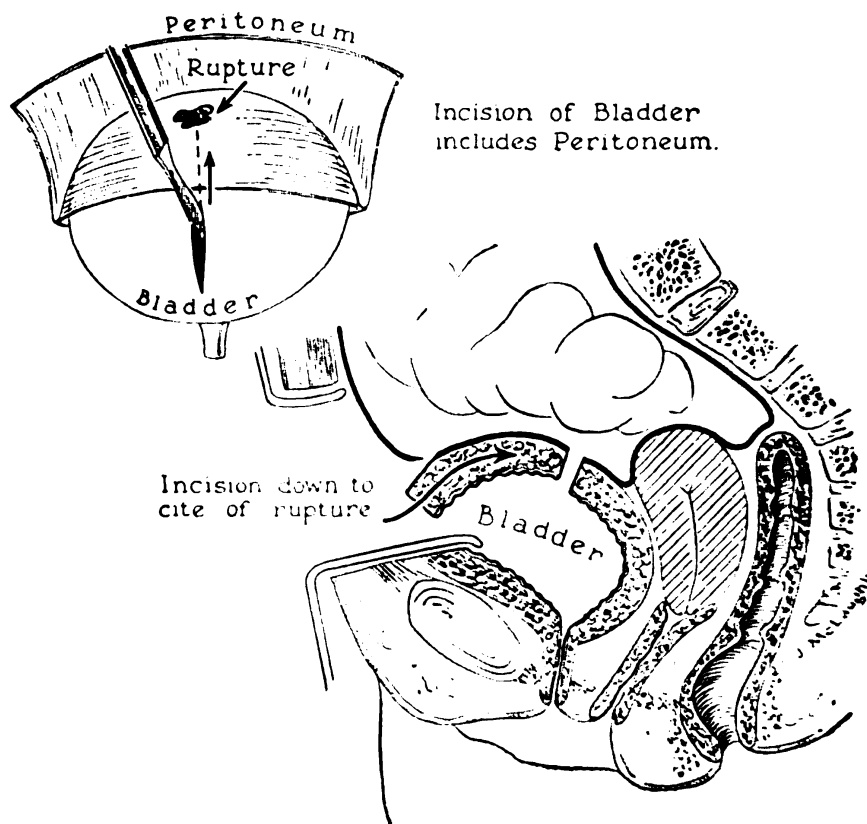


Figure 1.

Incomplete rupture is treated by passage of a No. 18 Foley catheter via the urethra. After the bag is distended, gentle traction is put on the catheter to approximate the torn edges of the urethra. It is usually impossible to suture this type of urethral tear from the suprapubic approach. Suprapubic cystotomy drainage is done. Tension is put on the urethral catheter by strapping it to the patient's leg.

Complete rupture of the membranous urethra, as demonstrated by cystogram and by a catheter buckling in the prevesical space, is also treated by cystotomy. A Foley catheter is threaded into the bladder by the "railroad" method. After the balloon is blown up, gentle traction is applied to the catheter to approximate the torn edges of the urethra. Gelfoam or Cellugauze is placed in the space to aid in the control of bleeding and drains are left in the prevesical space. The urethral catheter is left in place approximately 21 days. This method of approximation of the urethra was first described by Ormond and Cothran (24) using a Pilcher bag for traction. Modifications of that method have been described by Smith (25) and Reynolds (26). Reynolds (28) reports excellent post-operative results with this method of treatment. It has proved eminently satisfactory for us.

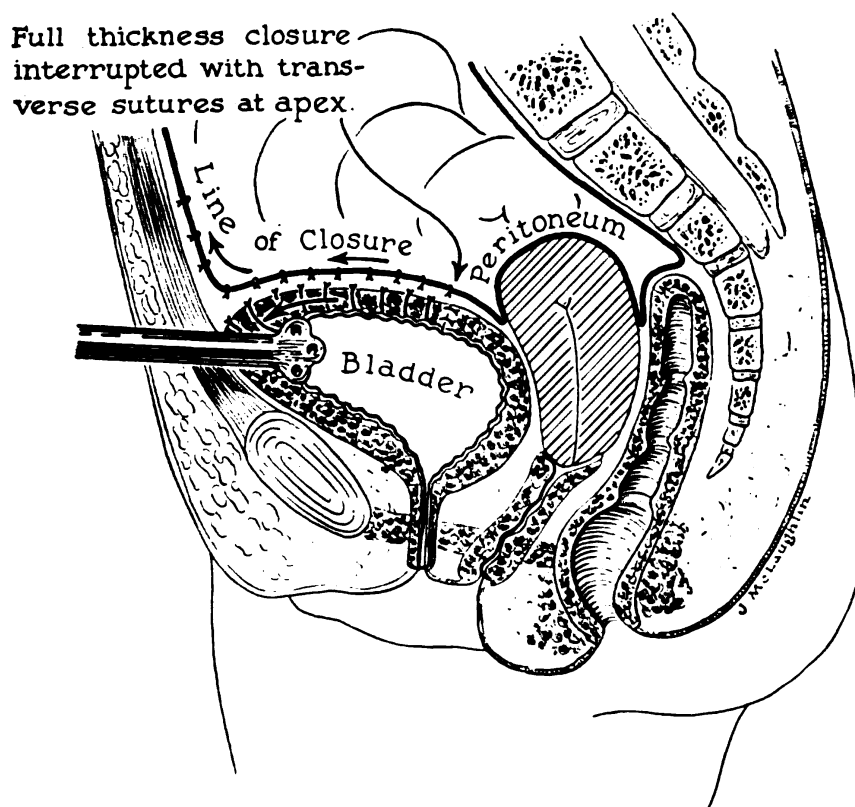


Figure 2.

Rupture of the membranous urethra is usually followed by sexual impotence. No successful therapy for this sequela has been recommended.

The treatment of extraperitoneal rupture during transurethral manipulation or during transurethral prostatic resection is immediate cystotomy and drainage. No doubt unrecognized small extraperitoneal extravasations occur occasionally during transurethral prostatic resection; when perforation of the capsule occurs the patient must be closely watched post-operatively for sepsis and immediate suprapubic cystotomy and perineal drainage carried out if indicated.

CASE REPORTS

Case 1.—A. H., a 21-year-old white female was admitted at 0400 on 22 May 1944 in a semicomatose condition, after an automobile accident about 1 hour previously.

Physical examination revealed evidence of profound shock, and although in a semiconscious state she complained of pain in the right forearm, left shoulder, right thigh, and pain in the lower abdomen accompanied by a bearing-down sensation. Abdominal examination revealed marked tenderness in the lower abdomen and over the symphysis pubis. Thorough roentgenologic examination by means of the portable unit showed comminuted fractures of both pubic rami, a fracture subluxation of the right sacroiliac joint, a transverse fracture of the



Figure 3.

midshaft of the left humerus. On catheterization of the bladder, only fresh blood could be obtained and accordingly a solution of sodium iodide was instilled into the bladder. Roentgenograms showed evidence of a rent in the dome of the bladder and an escape of fluid into the peritoneal cavity (fig. 3).

Surgical intervention was delayed for 10 hours following the accident while the patient was treated for shock. She received 2 units of plasma, 1,000 cc. whole blood, and 1,000 cc. dextrose and saline solutions intravenously; also heat, adequate morphine sulphate, and

first aid immobilization of the fractures. On recovery from shock an operation was done under sodium pentothal and nitrous oxide anesthesia and the defect in the bladder was closed.

Operative procedure.—A transverse suprapubic incision was made, the bladder exposed and bloody fluid escaped from the perivesical space. In the region of the symphysis were multiple jagged bony fragments with vesical rupture proximal to the internal sphincter. The bladder was opened by continuing this wound superiorly. A large rent in the dome admitted omentum and a loop of small bowel into the bladder. Because the exposure gained by the transverse suprapubic incision was insufficient, a midline incision was carried from the transverse incision up to the umbilicus and the peritoneal cavity opened. The bowel and omentum were then delivered into the peritoneal cavity, from the bladder. Repair of the bladder rupture was facilitated by surgically connecting the ruptures in the bladder and peritoneum. A continuous line of interrupted sutures from the inferior angle of the peritoneal wound was carried to its conclusion superiorly, closing the peritoneal cavity tightly. The bladder wall defect was then closed by placement of interrupted sutures beginning at the base of the bladder wound and then carried outward and down to the site of the placement of the cystotomy tube, the lowest angle of the wound at the site of the extraperitoneal rupture was closed also with interrupted sutures. A Foley bag urethral catheter was left indwelling. Necessary orthopedic procedures and care were instituted by Dr. Alvin S. Isaacson, instructor in surgery (orthopedics), University of Michigan Hospital.

Post-operative course.—The convalescence was entirely uneventful. Chemotherapy in small doses was maintained throughout her hospital stay. The suprapubic tube and Foley bag catheter were removed 6 weeks post-operatively. Three days later the patient was voiding normally. Repeated urine examinations during her 3 months' hospitalization showed a persistent asymptomatic bacillary infection of the bladder. This was still present in minimal amounts for 6 months post-operatively.

Case 2.—R. P., a 24-year-old white female was admitted on 2 July 1945 after an automobile accident about 2 hours previously. She was thrown from a car, but the exact mechanism of the injury could not be determined.

Physical examination revealed clinical evidence of mild shock. The patient complained of a severe desire to urinate, but could express only a few drops of bloody urine. There were signs of a compound fracture of the left femur, compound fractures of both ischia, and a large laceration in the perineum. There was marked tenderness in the hypogastrium and over the symphysis pubis.

On catheterization, $4\frac{1}{2}$ ounces of very bloody urine were obtained and accordingly a cystogram was made at the bedside by injection of Neoskiodan into the bladder and use of the portable x-ray unit. Roentgenograms indicated a rupture of the superior portion of the bladder with dye entering the peritoneal cavity (fig. 4). During the examination the patient complained of unbearable pain in the lower abdomen and an intense desire to void. The full amount of injected material could not be withdrawn following cystography. Other roentgenograms at the same time showed a comminuted fracture of the midshaft of the left femur, fractures of both ischia, and a separation of the right sacroiliac joint and the symphysis pubis.

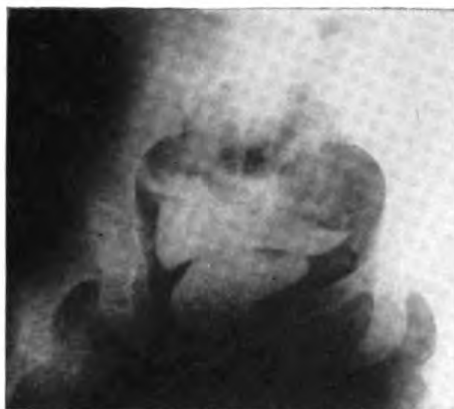


Figure 4.

The operative procedure was similar to that described in Case 1. A transverse incision was again used and had to be extended inferiorly for adequate exposure.

Post-operative course.—The convalescence was entirely satisfactory. The suprapubic tube was removed at the end of the third post-operative week. There was immediate onset of bladder function with slight suprapubic drainage which lasted 1 week. The bladder function remained entirely satisfactory but was complicated by an asymptomatic chronic bacillary and coccal urinary infection, in progressively lesser degrees, until the patient was discharged.

Case 3.—W. S., a 54-year-old white male; 1 hour before admission on 3 November 1947 he was caught in a standing position between a concrete wall and a slowly moving truck. He lost consciousness and was admitted to the hospital in mild shock. He had not voided since the accident.

Physical examination revealed a well-developed and well-nourished male with ecchymosis of the penis and scrotum with moderate swelling, and inability to flex the hips with ability to move the knees and toes. Extreme pelvic tenderness on pressure over anterior superior iliac spines and symphysis pubis. There was



Figure 5.

blood at the urethral meatus. The prostate was not palpable. A catheter was inserted into the urethra and no urine was obtained. Diodrast was instilled and bedside roentgenograms taken with the portable x-ray unit. The roentgenograms showed comminuted fractures of the pelvis involving the left sacroiliac joint and superior ramus of the right pubis with a probable fracture of the left transverse process of the fifth lumbar vertebra. The Diodrast was entirely extraperitoneal (fig. 5).

Operative procedure.—After receiving adequate preliminary therapy for shock the patient was taken to surgery. Through a transverse suprapubic incision complete separation at the prostatomembranous urethra was demonstrated,

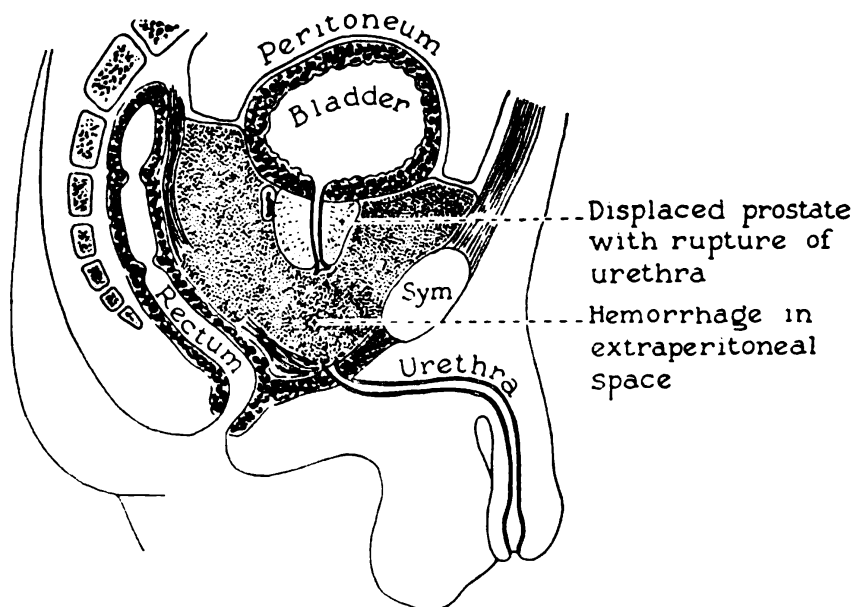


Figure 6.

after much blood was evacuated from the pelvis. A cystotomy was then carried out, with release of clear urine. A Foley catheter (75 cc. pear-shaped bag) was threaded into the bladder by the "railroad" method—traction was placed on the catheter with excellent approximation of the urethra. A cystotomy tube was left in the bladder, drains placed in both periprostatic spaces, and the wound closed in layers with chromic catgut (figs. 6 and 7).

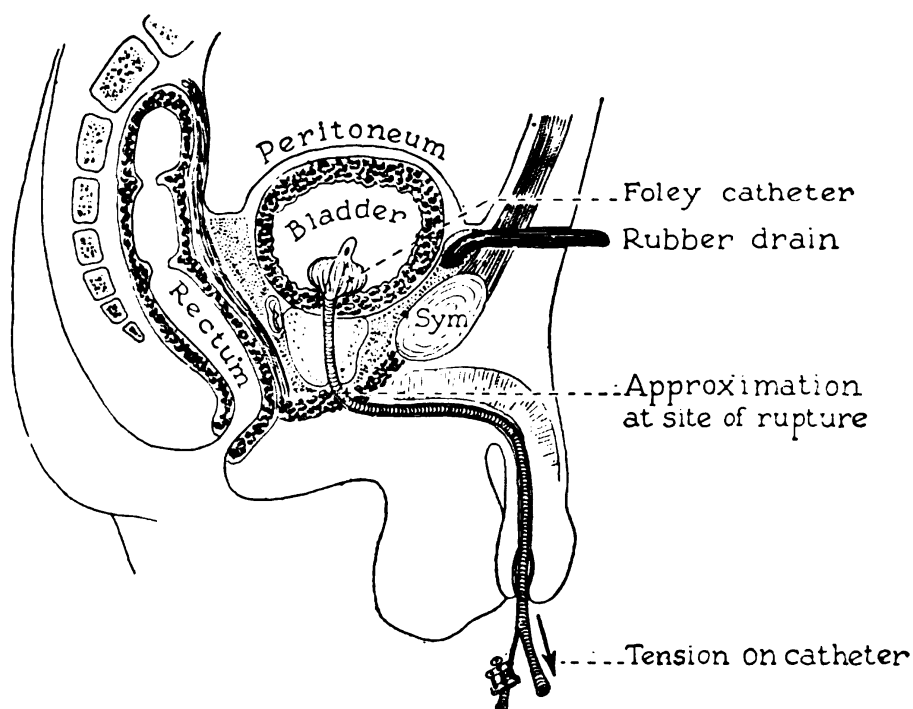


Figure 7.

Post-operative course.—The patient's convalescence was uneventful. The urethral catheter was left in place for 4 weeks and the patient voided well after it was removed. Decrease in force and size of stream over the next 4 weeks necessitated dilatations with a No. 29F sound at approximately 2-week intervals. When last seen 4 months post-operatively a No. 26F steel sound was passed via the urethra without meeting obstruction.

CONCLUSIONS

1. Rupture of the bladder is a serious surgical emergency. To treat this condition expectantly is to invite disaster.
2. Patients having proved urinary extravasation must, after treatment of shock and immobilization of fractures, have proper surgical treatment of the genito-urinary complications. Secondary consideration should be given to orthopedic treatment.
3. A method of simultaneous exposure of the bladder and peritoneal wounds is presented.
4. A midline suprapubic incision is recommended for exploration.

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Routine Sigmoidoscopy

A Review of 300 Consecutive Examinations

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AT THIS hospital sigmoidoscopic examination with a 25 cm. sigmoidoscope is done on all patients admitted with ano-rectal complaints.

During the period from 1 January 1947 to 31 July 1947, 300 consecutive sigmoidoscopic examinations were done as part of the complete work-up which includes a careful history, and complete physical examination. Digital, anoscopic, and proctosigmoidoscopic rectal examinations are also included. The patient is prepared by cleansing enemata the night before. Some are given $1\frac{1}{2}$ grains of a barbiturate about 1 hour prior to the examination. The patients are examined in the knee-shoulder or knee-chest position because of the absence of a special table (8). Gentleness is emphasized in carrying out the examination and the sigmoidoscope is passed under direct vision as recommended by Smith (8), Buie (2), Andresen (1), and others. That these precautions are justified is well borne out by Andresen (1) who reported 94 cases of perforation of the rectum or sigmoid colon, following sigmoidoscopy; 45 deaths occurred, a mortality rate of 47 percent.

All the patients in this series were males, age 17 through 75. The majority of the patients were in the 20-45 age group.

More than 90 percent of the patients examined had been admitted to the hospital with the diagnosis of hemorrhoids. The most common complaints were rectal bleeding with or without local pain, diarrhea, or alternating diarrhea and constipation.

TABLE 1.—*Diagnoses*

Hemorrhoids.....	120	Periproctitis.....	1
Cryptitis and Papillitis.....	25	Condyloma accuminata.....	1
Fistula-in-ano.....	14	Anal papilloma.....	1
Anal fissure.....	12	Pinworm disease.....	1
Ulcerative colitis.....	5	Amebiasis.....	1
Colitis.....	2	Polyp (single or multiple).....	15
Mucosal prolapse.....	2	Negative.....	93
Pruritis ani.....	1		

As shown in table 1, the diagnosis of hemorrhoids without pathologic changes in the rectum or lower sigmoid colon was made in 120 or 40 percent of the cases; cryptitis and papillitis in 25 or 8 percent; fistula in 14 or 4.6 percent; and polypoid lesions in 15 or 5 percent. Ninety-three or 31 percent of the examinations were negative.

The age distribution of patients with polyps was as follows: less than 20, 0; 20 to 30, 4; 30 to 45, 4; 45 to 60, 5; and 60 and above, 2. In 9 patients a single polyp was present and in 6 patients multiple polyps were noted. The incidence of polyps in this small series was 6 percent compared to 7 percent reported by Swinton (9) in a series of 1,843 consecutive examinations and 9.5 percent as reported by Helwig (4) who examined the entire colon in 1,460 consecutive autopsies. Multiple polyps have been reported to occur in from 35 to 42 percent (4) (9) (10) as compared to 40 percent in this group.

The most common symptom of the patients with polypoid lesions was rectal bleeding, usually bright red blood, associated with bowel movements. Alteration of bowel habits was the next most common complaint (table 2). The findings are in accordance with those of other observers (2) (3) (9) (10).

TABLE 2.—*Symptoms of patients with polyps.*

Rectal bleeding-----	11	Constipation -----	2
Diarrhea -----	6	Weight loss-----	3

The majority of patients were admitted to the hospital complaining of hemorrhoids and in many instances the patient had been previously so informed upon seeking medical advice, because of rectal bleeding or altered bowel function. Jackman (6) reported that many patients seen at the Mayo Clinic with carcinoma of the colon and rectum, had previously received treatment for some other local condition, while the cancer remained undiscovered. Smith (8) also pointed out how frequently hemorrhoids are treated when there is present, within reach of the examining finger or the sigmoidoscope, a coexistent carcinoma. Twelve of the 15 patients with polypoid lesions were found to have coexistent ano-rectal pathologic changes.

Subsequent to the discovery of polypoid lesions in the lower bowel, whether malignant or benign, barium enema and air contrast studies are done to determine the presence of other polyps beyond the reach of the sigmoidoscope.

In all instances where polyps were seen, a specimen was removed for biopsy. Whenever possible the entire polyp including a portion of the base was removed and the base fulgerized. Further treatment was based upon the pathologic diagnosis, size, and location of the lesion.

The pathologic diagnoses are summarized as follows: benign polyp in 7; polyp with hyperplastic changes in 4; adenocarcinoma in 3; and

inflammatory tissue in 1. This patient previously diagnosed clinically as chronic ulcerative colitis, was found to have many polyps in the rectum and lower sigmoid when examined with the sigmoidoscope. The gross appearance of one of the large polyps was suggestive of carcinoma. The pathologic diagnosis, sigmoid polyp with hyperplastic changes or malignant degeneration, was made in those cases in which there was hyperplasia, irregularity of glands, piling up of mucosa and mitotic figures but no involvement of the base of the polyp.

Surgery subsequent to excision of a specimen for biopsy was performed in 5 of the 15 cases. In 4, resection of a portion of the sigmoid colon and end to end aseptic anastomosis was done, while in the fifth case an abdomino-perineal resection was done. The patient, a young man, age 20, gave a history of familial polypoid disease of the colon. He was known to have multiple polypi for 2 years prior to admission to this hospital. Biopsy showed adenocarcinoma and at operation he was found to have lymphatic and liver metastases. The patient died 4 months after operation with widespread metastatic carcinoma. In 4 patients who were treated by segmental resection; the surgical specimens in 2 revealed that the polyp had been completely removed when a specimen for biopsy was taken and that there was no involvement of the base; in the other 2 the lesions were pedunculated but the pathologic changes extended well down the pedicle although the adjacent sigmoid mucosa was as yet uninvolved.

The value of the sigmoidoscope in the early diagnosis of carcinoma of the lower bowel has been repeatedly emphasized. Buie (2) states that fully 75 percent of the malignant lesions of the large intestine occur in that region which can be examined with a proctoscope. According to Turrell (11) benign polyps of the colon are always a potential source of malignant tumors and all mucosal excrescences and polyps of the colon should be removed for biopsy. Swinton (9) (10), Collier and Berry (3), and others have emphasized the importance of polyps as a source of malignancy. Helwig (5) in his study of 1,460 consecutive autopsies found 139 cases of adenomata of the large intestine; of these 10 (7.2 percent) showed malignant foci and 25 manifest carcinoma. Swinton and Warren (10) found that 14 percent of malignant tumors of the colon and rectum can histologically be demonstrated to have arisen in benign mucosal polyps. The local excision of a pedunculated adenoma showing early malignant changes is a sound procedure when it can be demonstrated beyond any question that there has been no extension of the malignant process into the pedicle or the bowel wall. The importance of finding polypi in the early approach to diagnosis of cancer of the rectum and colon was emphasized by Lahey (7) who described the polyps as "real precancerous lesions."

CONCLUSIONS

The sigmoidoscope is a valuable diagnostic instrument in the early detection of malignancy of the lower bowel. Sigmoidoscopy is a relatively easy and safe procedure and should be a part of the complete physical examination. This is particularly true in those patients who present complaints of rectal bleeding and alteration of the function of the bowel. It is strongly believed that this examination should never be omitted prior to elective surgery for hemorrhoids or other ano-rectal pathology.

SUMMARY

1. Three hundred consecutive sigmoidoscopic examinations have been reviewed.
2. There were 15 cases of polypoid lesions within reach of the sigmoidoscope, an incidence of 5 percent.

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Malignancies of the Sigmoid Colon

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THE importance of and interest in new growths of the large intestine is evidenced by the frequency which the subject has appeared in recent literature. Although many articles have been written by the foremost surgeons in the country, no outstanding or new developments in either diagnosis or treatment have been brought forth.

Anatomically, physiologically, and from a pathological standpoint, the colon is made up of three separate parts: The right colon; the left colon; and the rectum. The variation in health and disease of these three parts is as different as if they were three entirely separate organs without continuity. The sigmoid colon is so called because of its resemblance to the Greek letter Sigma with its double curve; it begins at the iliac crest, extends into the pelvis and ends at its junction with the rectum at the peritoneal reflection of the latter; it is supplied by the sigmoid artery, a branch of the inferior mesenteric. The anastomosis above is with the left colic artery but often there is no anastomosis below with the superior hemorrhoidal artery. It is important in segmental resection of the sigmoid that ligation of the superior hemorrhoidal artery be made above the critical point of Sudeck; that portion of the rectum between the last sigmoid artery and the bifurcation of the superior hemorrhoidal has scant vascular anastomosis. Ligation of the latter vessel below this point will lead to gangrene of the rectum.

The lymph vessels follow the course of the main blood vessels. The first group of lymph nodes, the epiploic, lie among the epiploic appendices on the outer wall of the intestines. These drain into the paracolic nodes behind the peritoneum. The intermediate nodes lie along the sigmoid vessels and empty into the central group along the aorta. These empty into the common lymphatic trunk. This distribution of the lymphatics is important because it indicates that the flow of lymph follows the blood vessels cephalad into the mesentery

unless there is an obstruction to divert or reverse this flow. Segmental resection for malignancy of the sigmoid would not be justified in the absence of this anatomical arrangement of lymphatics.

The nutritive and liquid contents of the fecal stream are absorbed by the time it reaches the sigmoid. The function of the sigmoid, therefore, is the storage of semisolid feces, for it is questionable if more than a very small amount of fluid is absorbed by the sigmoid. The solidity of its contents subjects it to more trauma than other portions of the intestinal tract, except the rectum. This trauma and consequent irritation may be the predisposing factor for the high incidence of carcinomas in this short section of the large intestine (about 16 percent of carcinomas of the colon (1)).

Errors in the diagnosis of malignancy are due in large part to carelessness, poor history taking, failure to evaluate the symptoms, and inadequate physical examination. These errors of omission are noted in view of the fact that almost 25 percent of our patients with lesions of the sigmoid had been operated upon previously because of a mistaken diagnosis of hemorrhoids.

At this hospital during an 8-month period, 300 routine sigmoidoscopic examinations were made upon patients with diagnoses of minor rectal conditions such as hemorrhoids and fissures. Fifteen, or 5 percent, showed pathologic changes in the sigmoid; 10 had benign polyps, mostly multiple; 4 had malignant polyposis; and 1 had an ulcerating adenocarcinoma. No case of previously suspected sigmoid disease was included in this study.

SIGNS AND SYMPTOMS

The early chief complaint is passage of blood or mucus by rectum or a change in bowel habits. Later the complaints are those of obstruction or change in the form of stools. These symptoms are usually interpreted by the patient, and sometimes by the physician, as evidence of some minor rectal disorder. It is true that pathologic changes in the rectum may be concomitant with disease in the colon and at times may be the result of it.

A change in bowel habits is one of the most constant symptoms. This may indicate a partial obstruction and is evidenced by episodes of diarrhea alternating with periods of constipation. There is often a feeling of incomplete evacuation. Every person presenting this symptom should have a sigmoidoscopic examination and a roentgenogram following a barium enema. Another symptom is epigastric distress during the meal or shortly after. This occurs because of distention of the colon from partial obstruction (2). This has led to many unnecessary cholecystectomies in instances where malignant disease of the sigmoid was not suspected and surgery for this more serious con-

dition was postponed until it became hopeless. The difficulty in maintaining the reduction of a hernia is another condition which follows distention of the colon and consequently operation for hernia repair is done with failure to cure the hernia or to disclose the underlying cause—the cancer.

Unfortunately, pain is not a prominent symptom except in the terminal stage.

TYPES OF LESIONS

The great majority of tumors of the sigmoid are moderately slow growing adenocarcinomas, grade I, II, or occasionally grade III, which may arise in a single isolated polyp or in polyposis, or as an ulcerative or scirrhous adenocarcinoma arising in the mucous membrane. Sarcoma is rare and when encountered is usually a lymphosarcoma. The lesion most commonly found is annular and constricting in type, except in those arising from polyps. This is the reason for the fairly early increase in intra-abdominal distention. It is estimated by various authorities that it takes six months for a lesion to invade half the circumference of the bowel and somewhat less than a year to encircle it completely. Inflammation and edema may produce obstruction in less time.

Small local carcinomas often give rise to extensive metastases while large indurated areas may show little lymphatic involvement. It is interesting to note that the size of the local lesion is not indicative of the number of metastases.

DIAGNOSIS

The use of barium enema is important in diagnosis. It may fail to show a characteristic roentgenogram but is often of value in determining not only the diagnosis but the operability and prognosis. The introduction of large amounts of barium by mouth should be done with extreme caution as the barium may be exceedingly difficult to remove.

Nearly 70 percent of all cancer of the large intestine can either be seen by the sigmoidoscope or else can be palpated.

Peritoneoscopy has limited use and in certain cases may help determine the presence of metastatic lesions in the liver and thereby aid in predetermining the location of the primary incision and whether the operation is expected to be palliative or curative.

Leahy (3) emphasizes that roentgenograms which show annularity and canalization should not prevent surgical exploration, although as a rule they represent late manifestations of the disease.

The following case reports present some of the more common errors and pitfalls which should be avoided. They were selected from a series of over 50 recent cases because the youth of these patients was a prominent misleading factor in diagnosis.

CASE REPORTS

Case 1.—R. G., a truck driver, age 27 years, was admitted on 17 June 1947 complaining of low abdominal cramps, diarrhea of 9 months' duration (6 to 8 soft brown stools daily) and rectal bleeding with some mucus. He had lost 10 pounds in weight in 9 months. He was examined by a physician who made a diagnosis of hemorrhoids and gave him one injection treatment. Two days following this he was admitted to this hospital with pelvic peritonitis. He recovered under Oschner treatment and discharged, without surgery, after 38 days. However, he continued to have epigastric distress and nausea at times but the diarrhea ceased. He was admitted to the medical service for study for evidence of peptic ulcer, but all examinations were negative. He complained of pains in his rectum and tenesmus and was then transferred to the proctology service. Two attempts were made to do sigmoidoscopic examinations but these were unsuccessful because of pain from infected crypts. A diagnosis of cryptitis was made, the lesions were excised and the patient discharged. He was readmitted to the hospital on 13 September 1947 with the same original complaints and this time a sigmoidoscopic examination could be made. A tumor mass was found 10 cm. from the anal margin, which on biopsy showed malignant changes in a polyp. On 29 September 1947, a laparotomy was performed and a segmental resection of the sigmoid was done. Exploration failed to show any metastases in the liver or any lymph node involvement. The lesions were pedunculated adenocarcinoma grade I, which had invaded the mucosa and muscularis but not the serosa or the pedicle. If it had not been too large for the sigmoidoscope to pass by it, the lesion could have been removed locally with safety, without laparotomy.

Coincidental with this lesion, an inflamed Meckel's diverticulum which was causing partial small bowel obstruction was found and excised. The appendix was also removed and was found to be acutely inflamed, on histologic examination. There is no doubt but that the appendix and diverticulum were causing many of his upper abdominal symptoms and one of them may well have been the cause of his early pelvic peritonitis.

The post-operative course was uneventful. He has regained the weight lost and a recent sigmoidoscopic examination shows a good lumen and normal mucosa at the site of the anastomosis.

This illustrates the benign type of malignant tumor; it originates in a polyp and may often be destroyed by local excision.

Case 2.—B. A., age 23 years, was referred to the medical service of the hospital with the diagnosis of amebic dysentery. His complaints were abdominal cramps, mild diarrhea with the passage of some mucus, for 10 weeks. Careful stool examinations showed no ameba and there were no ulcers on sigmoidoscopic examination. However, 4 polyps were noted; 17, 16, 14, and 13 cm. from the anal margin, varying from $\frac{1}{2}$ cm. to 2 cm. in diameter. The 2 largest were removed surgically and the 2 smaller ones were removed by electrocoagulation. Histological examination showed them to be benign.

A gastro-intestinal series was done and reported as negative. Unfortunately, there were no roentgenograms taken after the barium reached the sigmoid flexure. Diarrhea persisted for a few days and gradually diminished. A repeat sigmoidoscopic examination showed the need for recauterization. Following this, the diarrhea ceased and he passed 1 to 2 well-formed stools daily. He was discharged on 13 August 1947.

Subsequently he returned complaining of constipation and indigestion. He had a severe bromide rash from the uncontrolled use of triple bromides. Im-

mediate hospitalization was advised but he preferred to wait over the Christmas holidays.

On 8 January 1948 he was admitted as an emergency, presenting a picture of large bowel obstruction with a tremendously dilated cecum. At operation a tumor mass of the sigmoid located well above the previous polypi was exteriorized through a left rectus incision. Through a right McBurney incision a cecostomy was made to decompress the large bowel.

The sigmoid was doubly clamped and the tumor removed. Later the second and third stages of a Mikulicz operation were performed, keeping the cecostomy open all the while. Histologic studies showed adenocarcinoma, grade II (fig. 1). Before doing the third or closure stage of the Mikulicz operation, a sigmoidoscope was passed into both colostomy stomata and no additional polypi were found. No masses were palpable and the epicolic and paracolic lymph nodes showed only inflammatory reaction.

The convalescence was uneventful and the cecostomy closed spontaneously.



Figure 1.—Case 2. *Adenocarcinoma of sigmoid.*



Figure 2.—Case 3. *Multiple polypi of sigmoid.*

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Case 3.—P. A. M., age 24 years, was admitted on 8 July 1947 with the complaint of diarrhea for 3 years with occasional blood in the stools. Two years previously he had consulted a private physician who had told him that he had benign polyps that should not be operated upon.

Physical examination was negative except for multiple polypi in the entire sigmoid and rectum, and an ulcerated area at the recto-sigmoid junction. Roentgenograms showed no evidence of involvement of other parts of the colon and the chest was negative. He was operated upon on 4 August 1947 and an abdomino-perineal resection performed: a colostomy was made through a left McBurney incision. A sigmoidoscopic examination of the stoma failed to show any lesions above the colostomy. However, there were two lesions in the liver that clinically appeared to be metastatic and the lymph nodes along the aorta were enlarged. At that time, the operation was considered to be only palliative. There were several carcinomas present, as many of the polypi showed malignant degeneration, and an ulcerative adenocarcinoma, grade II, of the sigmoid mucosa was partially obstructing the bowel (fig. 2).

Subsequent investigation revealed that his father and mother were living and well. Examination of his brother showed several benign polypi; his sister and mother had none.

His course was generally down-hill and he died on 25 November 1947. Autopsy showed generalized abdominal liver and peritoneal metastases.

TREATMENT

The treatment of carcinoma of the sigmoid is as varied as its pathologic manifestations. For the sessile polyps, which should be considered premalignant, electro-coagulation is adequate. Care must be taken to avoid perforation of the bowel or charring, as the collection of serum on the peritoneal surface could produce adhesions and later intestinal obstruction.

The solitary carcinoma on a pedicle can be removed through the sigmoidoscope with reasonable expectation of cure, using a snare and electro-coagulation.

Segmental resection should be done in ulcerating carcinoma. The use of chemotherapy has reduced the danger of infection and permits the open type closure which lessens the danger of leakage and the formation of stricture. The mesentery should be excised as far as permissible without endangering the blood supply in order to remove the intermediate nodes. Gilstreet and David (4) recommend transillumination of the mesentery to locate the nodes.

A segmental resection is permissible in well-selected cases. But the idea is to remove *all* the carcinoma and not whether or not to preserve the sphincter. Therefore, as a general rule, abdomino-perineal resection is the safest and best procedure. A well-placed colostomy is not too hard to live with and is far better than a recurrence.

In many cases with lymph node involvement, or liver metastasis, the remaining months of a patient's life may be made more comfortable by resection of the colon or a colostomy.

Except in lesions with obstructive symptoms, a cecostomy or transverse colostomy is not necessary before or at the time of resection. With obstruction, one of these procedures should be used for from 10 to 14 days in advance of the definitive surgery in order to prepare the bowel and the patient for the operation.

Many cases do not come to diagnosis and surgery until acute obstruction with enormous dilatation of the colon and perhaps rupture of the cecum occurs. By this time, liver metastases and involvement of the entire chain of lymph nodes may have occurred and an operative procedure, at best, is palliative.

CONCLUSIONS

Youth does not preclude the presence of carcinoma of the colon.

A rectal, proctoscopic, and sigmoidoscopic examination should be as much a part of the routine of a physical examination at any age as an inspection of the nose and throat or taking a blood pressure reading. Sixteen percent of the carcinomas of the colon, as reported by Jockman (5), can be diagnosed with the sigmoidoscope; of these, one-fourth had received treatment for conditions other than the carcinoma which had remained undiscovered.

New advances in the technic of operations on the bowel and a more physiological approach to pre- and post-operative treatment have out-distanced our diagnostic ability required to bring these patients to early surgery.

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Carcinoma of the Ascending Colon

Report of a Case

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CARCINOMA of the right half of the colon, on the basis of symptoms, may be divided into three distinct groups: The dyspeptic group; the anemic group; and the palpable mass group. It must be realized, however, that this grouping is arbitrary and that a case in the dyspeptic group may have a certain degree of anemia, while a patient with anemia may have variable degrees of dyspepsia.

Patients in the dyspeptic group, represent approximately one-third of the cases, usually present vague and indefinite symptoms that often lead to errors in diagnosis and delay in definitive treatment. Rankin and Graham (4) state that almost as many of these patients are operated upon for subacute appendicitis and chronic cholecystitis, as patients with carcinoma of the rectum who are operated upon for hemorrhoids. Because of the relatively large diameter of the ascending colon and its fluid contents, complete obstruction is uncommon. When obstruction does occur, it is usually produced by a tumor at the hepatic flexure or by one impinging upon the ileocecal orifice. Complete obstruction produced by a carcinoma in the middle of the ascending colon is a rarity. Burgess (1) states that obstructions occur six times as often on the left side of the colon as on the right side. Coller and Berry (2) noted that only 3 percent of the carcinomas of the right colon produced obstruction.

The largest number of cases of carcinoma of the right colon fall in the anemia group. According to Koons (3), the average hemoglobin was 60 percent in 70 unselected cases. In Rosser's series (5) moderate anemia was recorded in 66 percent of the patients and severe anemia in 38 percent. Many of these patients were treated for secondary anemia for months before the diagnosis of carcinoma was made.

The palpable tumor group, representing about 10 percent of the cases, are those in which a tumor is accidentally discovered by the

patient, or in the course of a routine physical examination. This group presents few pitfalls in diagnosis, and there usually is no delay in definitive treatment.

The following case of adenocarcinoma of the ascending colon is noteworthy because the lesion, located 2 inches above the ileocecal valve and not impinging upon it, produced complete obstruction. It is an example of one of the pitfalls in diagnosis, in that the patient's appendix was removed 7 months prior to definitive surgery. The complete lack of anemia, the patient's age, and the widespread deposition of calcium in the tumor are somewhat unusual.

CASE REPORT

R. T. S., a veteran 28 years of age, was admitted to the hospital at 2030 on 26 February 1948 complaining of severe abdominal pain. The pain, which began in his right upper and mid-abdomen at 2100 the previous day and had persisted since onset, was dull and constant with frequent severe colicky exacerbations but did not radiate. He did not vomit nor was he nauseated. On the morning of admission he had a normal stool and passed gas by rectum a few hours before admission. There were no urinary symptoms.

He stated that he had always been robust until about April 1947, when anorexia, vague dyspeptic symptoms, and loss of weight and stamina began. During the next 3 months he lost 20 pounds in weight. In August 1947 his appendix was removed and he was told that he had had a partial intestinal obstruction and peritonitis, but not appendicitis. He was discharged from the hospital 9 days after operation. No post-operative roentgenograms were made. He never regained his strength, and continued to lose weight, losing 40 pounds since April 1947. He had been constipated occasionally during the past 3 months, and had had intermittent and occasional severe "gas pains" during the past 3 weeks.

Physical examination.—The patient was a very tall, asthenic, poorly nourished but well-developed young man in obvious distress. He would lie quietly in bed for a few minutes, and then would grimace with pain and move restlessly about for 30 to 60 seconds. Temperature, 100.4° F.; pulse, 90; respirations, 18. The abdomen was mildly distended, and abdominal respiratory excursion was limited but not absent. There was marked rigidity of the right abdominal musculature, generalized abdominal tenderness most marked over the right lower abdominal quadrant, in the region of a well-healed McBurney scar, and rebound tenderness over the entire right abdomen. Auscultation revealed increased peristaltic sounds, occasional peristaltic "rushes," and the sharp, definitely demarcated, musical "tinkle" so commonly heard in intestinal obstruction.

Laboratory report.—Red cell count, 5,100,000; leukocytes, 3,800 with a normal differential count; urinalysis negative; scout roentgenogram of all the abdomen with the patient standing revealed several dilated loops of small bowel in the mid-abdomen and right lower abdomen, and a few loops showing fluid levels (fig. 1).

Operation was performed at 2350 on the night of admission. Pre-operative diagnosis: mechanical obstruction of the terminal ileum. After the administration of a spinal anesthetic the tenderness and rigidity disappeared and a firm mass the size of a baseball was palpable in the right mid-abdomen. It was then obvious that the obstruction was not due to a simple post-operative adhesion.

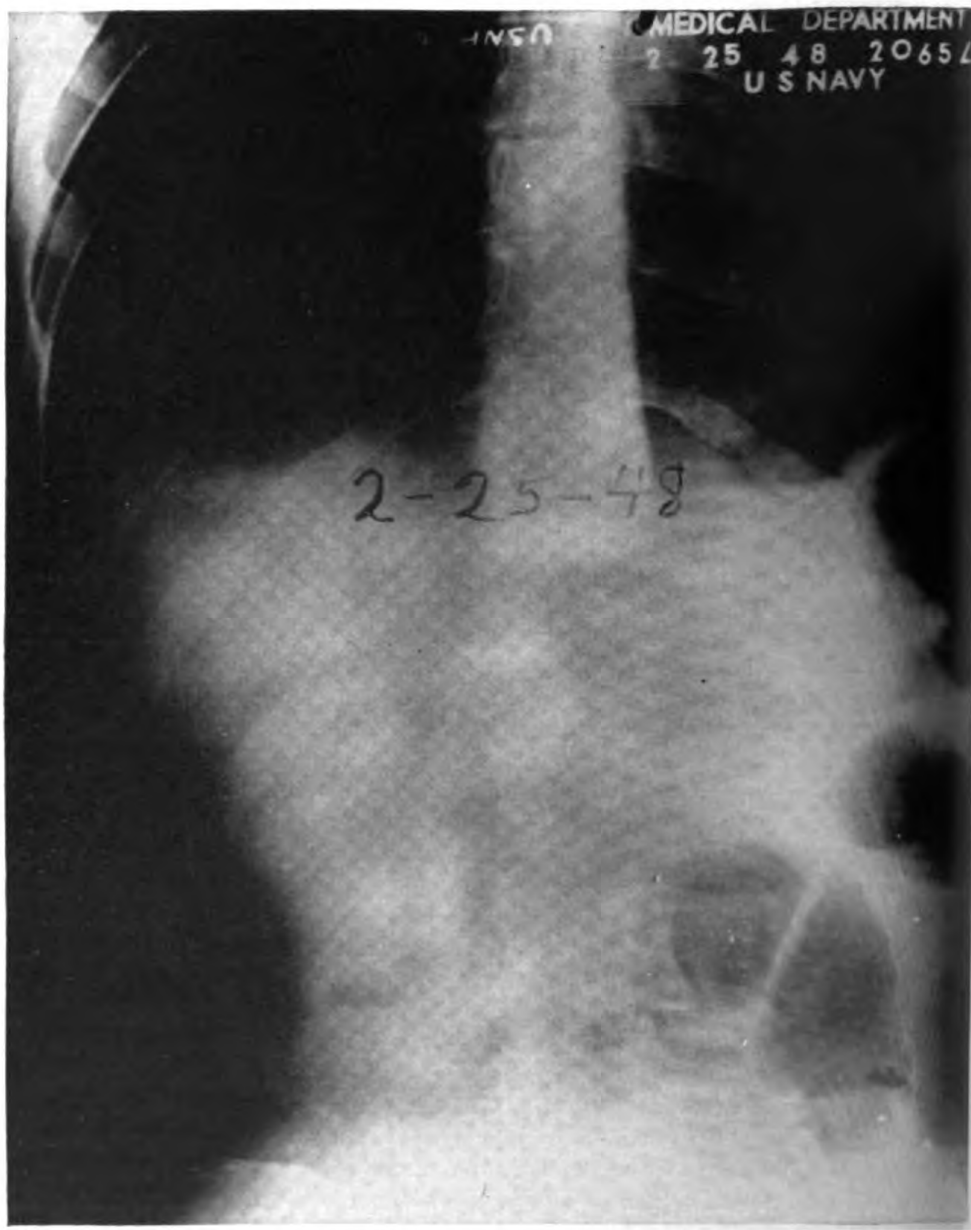


Figure 1.—Scout film of abdomen. Note fluid levels.

A transverse incision, transecting the right rectus muscle, was made one-half inch above the umbilicus. An excess of serosanguineous semiturbid peritoneal fluid was present, and the peritoneum was inflamed. The great omentum was adherent to the middle of the ascending colon. Upon its separation, a hard mass involving the circumference of the ascending colon was palpated and visualized. On the medial border of this mass was a firm yet fluctuant ovoid projection 2 cm. in diameter. The ascending colon distal to the mass was normal. The proximal ascending colon and cecum were moderately dilated. The terminal ileum was dilated to approximately three times its normal size, and was considerably larger than the transverse colon. The pelvis was filled with dilated loops of ileum.

A side to side ileo-transverse colostomy was performed, the anastomosis being made approximately 14 inches from the ileocecal valve and at the junction of the middle and right thirds of the transverse colon. The abdomen was closed in layers without drainage. Absorbable catgut sutures were used throughout the operation, except for the use of cotton to approximate the skin edges.



Figure 2.—Scout film of abdomen. Note numerous opacities in the region of the tumor.

Penicillin, 50,000 units every 3 hours, sodium sulfadiazine, 1 gram every 4 hours, ascorbic acid, and adequate parenteral fluids were administered. The Miller-Abbott tube and continuous suction were discontinued on the third post-operative day; the patient was afebrile and ambulatory.

Interim therapy, between the emergency and the later definitive surgery, consisted of a high caloric, high protein diet, oral multivitamins, and parenteral administration of vitamins C and K. Pre-operative sulfonamide and streptomycin "sterilization" of the bowel was deemed unnecessary, since extirpation of the right colon would not involve open anastomosis.

The erythrocyte count remained about 5,000,000, and the leukocytes about 4,000, with a normal differential count. Roentgenogram of the chest was negative. A scout film of the abdomen revealed multiple calcified areas in the region of the tumor (fig. 2). Roentgenograms following a barium enema and a gastro-intestinal series, were indicative of a mass containing multiple areas of calcification completely occluding the ascending colon. The inner margins of the lesion lacked the irregularity characteristic of carcinomatous lesions of the bowel, and a well-functioning anastomosis between the small bowel and transverse colon was noted (fig. 3).



Figure 3.—Combined barium enema and gastro-intestinal series.

On 11 March 1948, a right colectomy was performed under spinal anesthesia. The abdomen was opened through the former incision. The secondary inflammation had subsided to a marked degree and the ileum was of normal diameter. The tumor mass was not adherent to the retrocolic structures. Twelve inches of terminal ileum, the cecum and ascending colon, and the proximal third of the transverse colon, together with the regional lymph nodes, were removed. The divided ends of the terminal ileum and transverse colon were closed with No. 00 chromic catgut on an atraumatic needle. The abdominal incision was closed in layers with No. 1 chromic catgut and the skin was approximated with cotton.

The patient made an uneventful recovery. Levine tube and penicillin were discontinued on the second post-operative day, and the patient was ambulatory, afebrile, and on a soft diet on the third post-operative day.

High voltage roentgen therapy, to the right and mid-abdomen, was begun on the seventh post-operative day. The patient was discharged from the hospital upon the completion of this therapy 3 weeks later.



Figure 4.—Section through firm portion of tumor. Adenocarcinoma, ascending colon. Grade II (Broders).

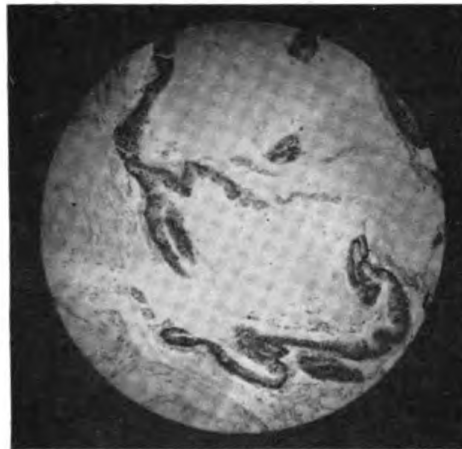


Figure 5.—Section through soft portion of tumor. Note widespread mucinous degeneration.

Pathological findings.—The specimen consists of the terminal ileum, ascending colon, and a portion of the transverse colon. Two inches above the ileocecal valve is a large annular mass, 8 cm. in width and 4 cm. thick. The mass is nodular on the surface; it cuts with increased resistance, and numerous calcium deposits 0.5 to 2 mm. in size are noted throughout its substance. On the medial border of the mass is a liquefied area of degeneration approximately 2 cm. in diameter. In numerous other smaller areas the tumor appears to have undergone degenerative changes and contains considerable gelatinouslike material. The lesion has invaded the mucosal lining of the bowel in an annular fashion for a distance of 8 cm. The lumen at this region appears to be obliterated. The mucosa and the wall of the large bowel on either side of the tumor mass appear to be normal. Sections of numerous lymph nodes removed with the specimen reveal no gross evidence of metastases.

Microscopic sections show large irregular branching malignant glands in a myxomatous stroma. The tumor appears to be invasive, and in places the glands are separated by a considerable amount of mucinous material, particularly in the areas of extensive mucinous degeneration (figs. 4 and 5). Multiple sections of the lymph nodes reveal edema, congestion, and inflammatory reaction, but no evidence of malignancy.

Pathological diagnosis.—Adenocarcinoma of the ascending colon, Grade 2, with mucinous degeneration. There was no evidence of metastasis to the regional lymph nodes.

COMMENT

Patients with dyspepsia and vague right abdominal pain should not be subjected to appendectomy or cholecystectomy prior to roentgenographic study of the right colon. If operation is performed prior to such roentgenographic examination, and the pathologic findings do not account for the symptoms, the right colon should be examined at the time of operation, and radiographic studies of the colon should be made prior to the patient's discharge from the hospital.

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Fulminant Epidemic Hepatitis

Report of a Case in An Infant

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SINCE 1942, there have been numerous reports of epidemics of hepatitis occurring in both military and nonmilitary personnel (1) (2) (3) (4) (5) (6) (7). Most of the cases occurred in persons between the ages of 18 and 35 years. Lucke has described the pathological findings in military personnel of the U. S. Army (8) (9). The disease has become one of clinical importance and significance.

CASE REPORT

A white male infant was born on 2 August 1946 as a spontaneous LOA.

The mother, age 21 para 1, had a normal antepartum and postpartum course and received no serum or whole blood. She gave no history of recent immunizations or jaundice. During her pregnancy and hospitalization for delivery, all physical examinations were within normal limits. Repeated hemoglobin determinations varied between 10 and 12.5 gm. percent. Blood, Rh positive. The red and white cell counts and urinalyses were normal. Vaginal smear revealed no pathologic organisms.

During delivery nitrous oxide and oxygen anesthesia were used. No opiates or other drugs were given prior to the third stage of labor.

The infant breathed spontaneously and the physical examination of the 6 lb. boy immediately after birth was normal. On the third day, a minor superficial breast irritation was noted. This responded to hygienic measures without the use of drugs.

On the tenth day the child had fever with occasional temperature elevation ranging from 101° to 102° F. rectally. He became listless and slightly cyanotic during the night and 60 cc. of plasma and 60 cc. of isotonic saline were given in addition to oxygen. White blood cell count, 11,900, 36 percent polymorphoneutrophils, 6 percent bands and 8 percent juvenile cells, 46 percent lymphocytes, 2 percent monocytes, and 2 percent eosinophiles.

The following day the temperature was normal and the child took his feeding satisfactorily. A chest roentgenogram showed no evidence of pathologic lung changes. The heart shadow was not unusual.

On the twelfth day his temperature ranged from 100° to 101° F. Ten thousand units of penicillin were given every 2 hours. Roentgenographic study of the chest again showed no abnormalities.

On the thirteenth day mild scleral icterus was noted; the abdomen was moderately distended and the liver palpable 2 to 3 finger breadths below the right costal margin. The child was listless and cyanosis appeared intermit-

tently; the temperature was 102.8° F.; respirations were shallow. Most of the feedings were regurgitated and supplementary hydration was required. Blood cultures were negative. The abdomen increased further in size and death occurred on the seventeenth day, apparently from respiratory failure.

AUTOPSY

Autopsy performed 10 hours after death showed the following; a white male infant with marked icterus; the thorax was symmetrical; and the abdomen was slightly distended.

Thorax

Approximately 75 cc. of serosanguineous icteric fluid were present in the left pleural space and 50 cc. in the right. The pleural surfaces were smooth and glistening. The lungs occupied about 80 percent of each cavity. The pericardium was not abnormal.

On gross examination the thyroid and thymus glands, the larynx, and trachea appeared normal.

The external surfaces of the lungs were smooth and pinkish-red. On section the cut surfaces were deep reddish-pink and exuded a frothy serosanguineous type of fluid when pressure was applied. The pulmonary vessels were engorged; no emboli or thrombi were seen.

The heart and all its structures and tissues appeared normal in size and shape. A patent ductus arteriosus was present.

Abdomen

The peritoneal cavity contained 300 cc. of serosanguineous fluid.

The liver was enlarged and nodular and the capsule appeared dull. Upon section, increased resistance was encountered, the cut surface appeared

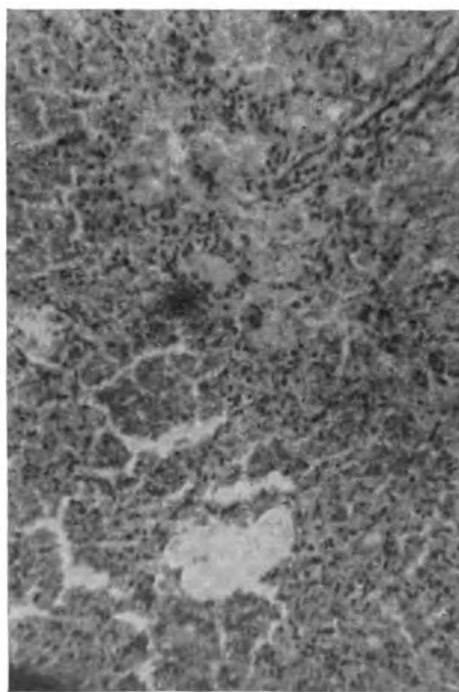


Figure 1. $\times 50$.



Figure 2. $\times 50$.

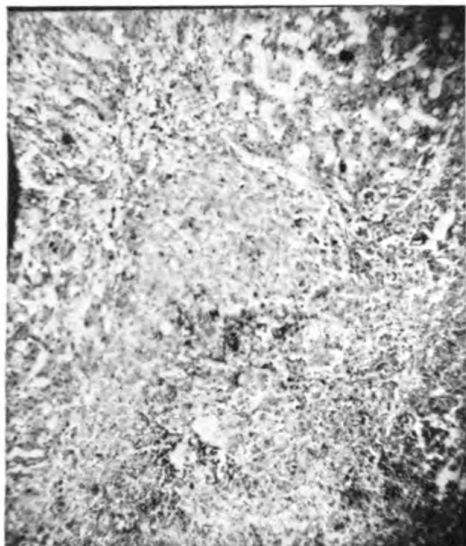


Figure 3. $\times 50$.

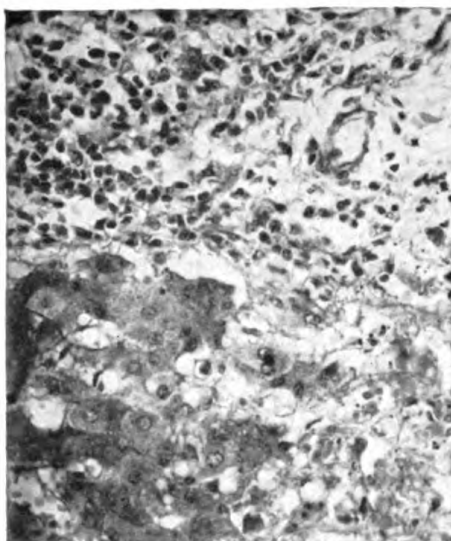


Figure 4. $\times 220$.

greenish brown and contained numerous elevated areas of deep green, firm tissue, 1 to 4 mm. in size.

All ducts probed were found patent. The gallbladder was normal and contained a small amount of clear colorless fluid.

The kidneys were normal. On sectioning, the cut surfaces were whitish-gray with prominence of the cortical zone, the latter having a seared meat appearance. The calyces and pelves were normal.

All other abdominal organs and structures were normal in size, shape, and consistency.

HISTOLOGIC EXAMINATION

The myocardium showed nothing of note.

The lungs showed infantile architecture of the bronchioles and the alveolar pattern. Most of the alveolar spaces were filled with red blood cells. An occasional bronchiole was also filled with red blood cells. Scattered pigment was seen which, for the most part, was confined to phagocytic cells, free in the alveolar spaces (fig. 1).

Spleen.—Congestion of the pulp was present with an occasional small hemorrhage. The malpighian corpuscles were small and not as distinct as usual. No fibrosis of note was seen (fig. 2).

Liver.—The major portion of the individual lobule was necrotic or contained only ghost forms of parenchymal cells. The remaining intact parenchymal cells were seen about the periportal triad. The bile ducts were prominent but

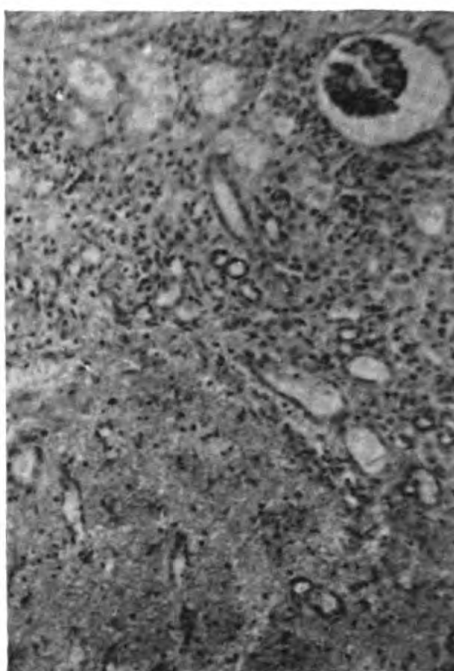


Figure 5. $\times 50$.

showed no evidence of hyperplasia. No evidence of regeneration of the parenchymal cells. Some fine granular pigment was present in the areas of necrosis (fig. 3).

A few polymorphoneutrophils and mononuclear cells were present in the vicinity of the triads (fig. 4).

Kidneys.—One area of hemorrhage which completely disrupted the interstitial tissue was present in the medulla. In the region of the hemorrhage, the tubules remained intact (fig. 5).

Thymus.—No unusual features were observed.

DISCUSSION

It is impossible to completely rule out reaction to the pooled plasma which was administered, but the rapid onset of the acute illness 2 days after plasma administration makes this unlikely. The symptoms, other than jaundice, also existed prior to plasma administration. The hemorrhage which occurred in the lungs and the kidneys could have been caused by reduced prothrombin levels as the result of severe liver damage. The congestion of the spleen and the ascites was secondary to the hepatitis as pointed out by Lucke and Mallory (9).

CONCLUSIONS

The fulminant form of epidemic hepatitis can occur in all age groups. A case has been presented that probably represents this form of hepatitis in a 17-day-old infant. No symptoms or signs of the disease occurred in the infant's mother. The clinical features of this disease as noted in this case emphasize the need of considering epidemic hepatitis in the differential diagnosis of jaundice in the newborn.

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Creeping Eruption

Report of a Case With Loeffler's Syndrome

SAMUEL H. HORTON, JR., *Lieutenant Commander (MC) U. S. N.*

CREEPING eruption is a term applied to a number of diseases of the skin characterized by tortuous migratory lesions produced by the burrowing of larvae. Persons who walk barefoot on the beaches, or children in sandboxes, or carpenters and plumbers working under houses, or gardeners are often victims. The majority of cases in this country are due to penetration of the skin by the larvae of a cat- and dog-hookworm (2). The disease is endemic along the Atlantic coast, particularly in Georgia and Florida. However, cases have been reported as far north as the coast of New Jersey.

Wright and Gold (1) reported a series of 26 cases of creeping eruption, 15 of which were observed for a period of 14 days or longer. Nine of these fifteen during their period of observation demonstrated transient migratory pulmonary infiltrations, peripheral eosinophilia, and a paucity of clinical signs or symptoms of systemic disease fulfilling the criteria of Loeffler's syndrome. Frequent serial roentgenograms were necessary to detect the pulmonary changes. All of their patients were afebrile and râles were not heard at any time. Peripheral eosinophilia varied from 1 to 32 percent. Sedimentation rates were normal except in two cases complicated by secondary infections, and cellulitis about the cutaneous lesions. Stool examinations were consistently negative for ova and parasites. There was no mention of therapy.

CASE REPORT

A. S., a 27-year-old white male was admitted to the U. S. Naval Hospital, Philadelphia, Pa., on 27 July 1948 complaining of a generalized pruritic dermatitis. He had been on duty in Jacksonville, Fla., during which time he lived in a trailer. Preparatory to moving, he crawled under the wooden porch attached to the trailer and for a period of about 2 hours he was lying on his back in moist, warm sandy soil. He was wearing only a pair of dungarees at the time. The next night he noted pruritic papules of the back and buttocks which he thought were ant bites. He proceeded to another activity and reported to sick bay where calamine lotion and oil were used without effect. He then traveled to his home on leave where neighbors prescribed kerosene, nail polish, 1 percent lysol, and ammonia. In desperation he came to Philadelphia where a private physician

treated him for scabies. The pruritus became almost unbearable and he presented himself for admission to this hospital. The intern in the admission room thumbed through a textbook of dermatology, found a picture of a case of a similar nature, and made the correct diagnosis of creeping eruption.

Physical Examination

The entire back and buttocks were covered with erythematous papules, some excoriated. A fine, wavy, raised linear dermatitis was scattered over this area and across the lower abdomen and extensor surfaces of both arms. The chest, posterior aspects of the legs, and the lateral surfaces of both feet were similarly involved (figs. 1 and 2). The genitalia, neck, head, palms, and soles were free. It was estimated that the active larvae numbered about 200. The remainder of the general physical examination including auscultation and percussion of the chest was negative.



Figure 1.—Appearance of patient at admission.



Figure 2.—Detail of larval lesions.

Course and treatment

The patient complained of general lassitude which was attributed to loss of sleep. He also had a slight nonproductive cough which persisted for several days in spite of saline gargles and other remedies. The chest remained clear to percussion and auscultation. The day after admission tissue was removed for biopsy in order to demonstrate the larvae but this was unsuccessful. About 12 burrows were frozen with ethyl chloride spray until the skin could be picked up between the fingers like cardboard. This required from 45 to 60 seconds for each area treated.

The next day treatment with fuadin (sodium antimony biscatechol) was started; 1.5 cc. was given intramuscularly, the dose was increased the second day to 3 cc., and thereafter to 5 cc. daily for a total of 25 cc. Daily routine and



Figure 3.—Chest roentgenogram taken 2 August 1948.

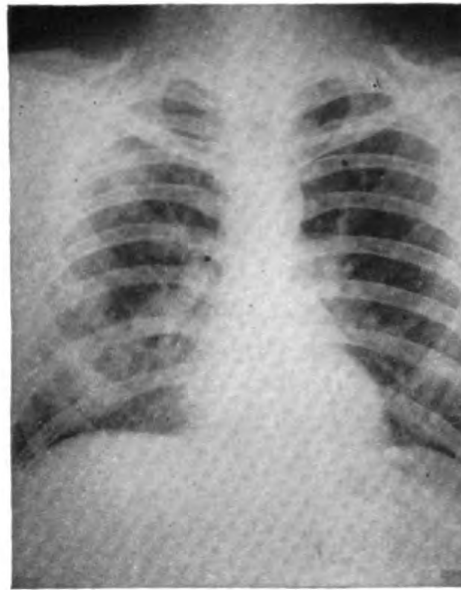


Figure 4.—Chest roentgenogram taken 7 August 1948.

microscopic examinations of the urine were negative. After the third day of treatment improvement of the skin lesions was noted and upon completion of the treatment only two burrows were demonstrable. These were frozen. The patient continued to complain of a dry hacking cough and for the first time inspiratory râles were heard over the right mid-lung field posteriorly but disappeared after 2 days. An eosinophilia of 7 percent had been recorded on admission and when the roentgenogram of the chest was reported as suggestive of acute pneumonitis the diagnosis of Loeffler's syndrome was apparent. Thereafter serial roentgenograms showed a remarkable change in the lungs from day to day (figs. 3, 4, and 5). The eosinophilia reached 46 percent before gradually returning to normal. Repeated examinations of the stools for ova and parasites were negative, as were repeated sedimentation rates. The temperature was never above 99° F. and the white blood cell count never exceeded 10,000.

Six days after the completion of the treatment with fuadin four new burrows suddenly appeared. These were frozen as before but further lesions appeared. Treatment with fuadin was repeated and he again received the same dosage. The urine remained negative and no untoward side effects occurred. Once more the skin lesions subsided and after four remaining burrows were frozen the skin

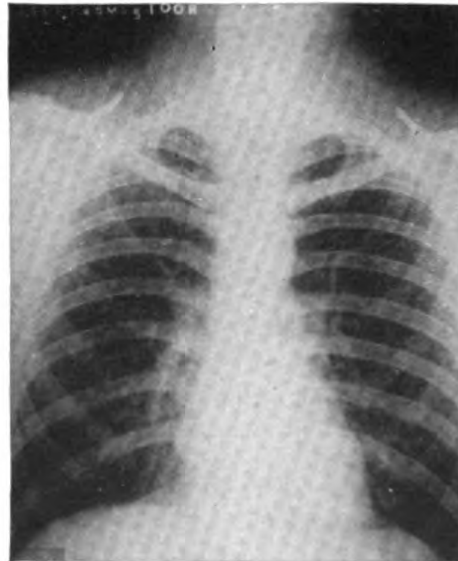


Figure 5.—Chest roentgenogram taken 2 September 1948.

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returned to normal except for residual depigmentation at the sites of the larval activity. A total of 30 larvae were treated with ethyl chloride spray and the remainder apparently succumbed to fuadin.

DISCUSSION

Shelmire (3) is credited with being the first to propose the use of ethyl chloride spray for the treatment of creeping eruption. Kirby-Smith (4) had more experience with the disease than anyone else in this country. In 1935 he presented a paper dealing with the treatment of creeping eruption and concluded that ethyl chloride spray was the safest and most effective single treatment. He advised freezing the skin for from 2 to 4 minutes. The author believes this is excessive and could lead to unnecessary tissue damage and secondary infection. The first to use fuadin in the treatment of creeping eruption was Smith (5) who reported the successful treatment of a 2½-year-old boy. Rubin (6) also reported a case of creeping eruption successfully treated with fuadin. He employed two courses of this drug and froze a remaining larva with ethyl chloride spray.

SUMMARY

1. A case of creeping eruption with associated Loeffler's syndrome is reported.
2. The larvae were effectively eradicated with fuadin and ethyl chloride spray.
3. In all cases of creeping eruption serial roentgenograms of the chest should be taken as this is the only means of confirming the transient pulmonary infiltrations.

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Plantar Wart Therapy

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PLANTAR warts are frequently noted in personnel of the Armed Forces and the solution of satisfactory treatment presents a difficult problem to medical officers in the field.

This article deals with the methods of therapy currently in use on our service. These are: (a) Silver nitrate applications; (b) electro-surgical removal; (c) high voltage roentgen therapy; and (d) carbon dioxide snow.

SILVER NITRATE THERAPY

This treatment can be used while the patient is ambulatory thus making it advantageous in this respect.

A saturated solution of silver nitrate is applied to the plantar wart with a cotton-tipped swab or applicator. First, the hyperkeratosis or so-called callus is trimmed with a No. 10 scalpel blade until capillary bleeding occurs. The area surrounding the actual plantar wart is covered with vaseline or a similar protective substance and the silver nitrate solution is applied by holding the applicator firmly against the wart for about 15 minutes. At this time the cotton is removed from the applicator with tissue forceps and left in place against the wart and a firm bandage is applied and left in place for about 24 hours.

The advantages of this form of treatment are: (a) The patient is ambulatory—can stay on duty; (b) silver nitrate can be easily obtained and easily transported, thus treatment can be given anywhere; (c) this treatment is specific for the mosaic type of plantar wart; and (d) cures have been obtained with this method when other treatment failed.

The main disadvantage of this treatment is that it usually has to be carried out for from 5 to 10 consecutive sessions at weekly intervals before results are obtained.

ELECTRO-SURGICAL REMOVAL

This involves the use of a cutting current from a high frequency apparatus and therefore is not universally available.

Technique.—The patient is placed face downward with the foot supported by a sandbag or block. The area is scrubbed with soap and water and tincture of iodine and alcohol applied. The injection

of a 2 percent solution of procaine hydrochloride in and around the wart gives excellent anesthesia.

The active electrode, a sterilized steel wire loop, 2 mm. in diameter, is held perpendicularly to the wart and with the cutting current set at desired intensity—just sufficient to let the loop penetrate easily without excessive coagulation—and guided through the center of the wart to a depth of about 6 mm. then rotated through 180° and withdrawn through the original opening. The procedure is bloodless and the incision is small.

The area is repainted with tincture of iodine and alcohol and a dry dressing applied. The foot is kept dry and dressed every other day for from 12 to 14 days. At the end of 14 days the superficial crust is removed, at which time the wound is usually found to be healed.

This is an excellent form of treatment, the patient remains ambulatory, and there is no residual pain as the adjacent nerve endings have been destroyed by the current. Cures will be obtained in from 75 to 90 percent of the cases.

HIGH VOLTAGE ROENTGEN THERAPY

This form of therapy must be limited to facilities where trained technicians are available and should be given only under the supervision of a radiologist.

Treatment is generally successful and can be given in either of two methods: (a) About 450 R unfiltered given every 3 to 4 weeks for about 5 treatments; and (b) about 1,200 R first dose and 1,000 R in 3 weeks. The size of the wart is a factor.

SURGICAL THERAPY

This method of treatment is impractical. Surgical approach is based on excision or curettement and therefore leaves an area of tissue which must granulate in before the patient is capable of full duty. Thus the patient experiences much discomfort and remains on the sick list at least 2 weeks. The treatment is, indeed, often worse than the disease.

CARBON DIOXIDE SNOW

This type of therapy appears to be the answer to the successful treatment of plantar warts.

One hundred and ten cases were treated with carbon dioxide snow. Of these 106 were recorded as cures, 2 as failures, and 2 did not return for observation so results were not known.

Of the 106 listed as cured, 84 required only 1 treatment, 27 required 2 treatments, and 5 required 3 treatments.

Technique.—A No. 10 surgical blade is used to trim the hyperkeratosis until capillary bleeding occurs. A piece of dry ice, the approxi-

mate size of the wart, is prepared and held with firm pressure on the surface of the wart for 60 seconds.

The patient notes a burning sensation and minimal discomfort in about 10 seconds but this does not increase during the next 50 seconds. The burning sensation persists for about 18 hours but is not disabling and the patient can carry on his usual duties. .

No bandage or medication need be applied to the site. The patient is instructed to use a razor blade to trim any callus that might develop and to return in 3 weeks. If at this time there is still pain or pressure or visual evidence of the plantar wart, another 60-second treatment is given with carbon dioxide snow under firm pressure. The patient is again instructed to trim down any keratosis which appears and to again return in 3 weeks. In our series of cases only 24.5 percent required the second application.

No complications such as infection or severe pain occurred. All patients remained ambulatory and the cure rate, 96.9 percent, was higher than that with any other method of therapy.

Our source of dry ice was the Kidde apparatus which forms dry ice in any desired size through the use of glass adapters and carbon dioxide cartridges. The apparatus is very compact, easily used, and readily available from the supply depot.

SUMMARY

Carbon dioxide snow therapy in plantar warts gave a cure rate of 96.9 percent with no complications. It is believed to be the best and easiest method of treatment for plantar warts.

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Leukonychia Totalis

Review and Report of a Case

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LEUKONYCHIA totalis is one of the three varieties of leukopathia (unguium). The entire nail is white; is usually found in young persons; and is a simple hereditary deformity.

The pathogenesis of the disease is not understood. As cited in a previous article by this writer (5), Singer (4) summarizes the causative factor as follows: "As keratinization is due to decreased metabolism of the germinal layer any increase in the metabolic rate will delay this, keratohyaline granules will persist and leukonychia will result." Expressed differently the whiteness of the nails is due to the failure of normal physiologic keratinization (imperfect cornification) of the horny cells of the nail plate. Josephson (2) concluded that leukonychia had some relation to metabolic disturbance and when the acid-alkaline balance was upset in the direction of alkalosis.

CASE REPORT

J. A. C., a 30-year-old white male was admitted on 16 September 1947 because of sequelae from gunshot wounds of the left leg. An incidental finding of interest during the routine physical examination was the rare condition of the nails, leukonychia totalis (fig. 1). The patient gave a history of having entirely white fingernails and toenails as long as he could remember. He stated that he seldom has colds or upper respiratory infections. He had smallpox at the age of 13 years. Other members of his immediate family known to have abnormality of the nails are: His mother, age 62, all nails on both hands, and 1 nail on each foot involved; his sister, age 28, 2 nails on right hand, 1 on the left, and 1 nail on each foot involved; and his brother, age 23, all nails on both hands, and 1 nail on each foot involved.

Physical examination.—The patient was a well-developed and well-nourished male. The general physical examination was normal except for a scar, 2.5 cm. in length, from gunshot wound in the left pretibial area.

All laboratory examinations were within normal limits.

Nails.—All the nails of the fingers and toes were chalk white. No lunula could be distinguished. The nails were not brittle and there was no fraying of the edges. No grooves or irregularities could be observed. The thickness of the nails appeared to be average. With the exception of the surface of the third right digit fingernail having a flattened appearance suggesting a spoon-shaped nail there was no other associated dermatologic condition.

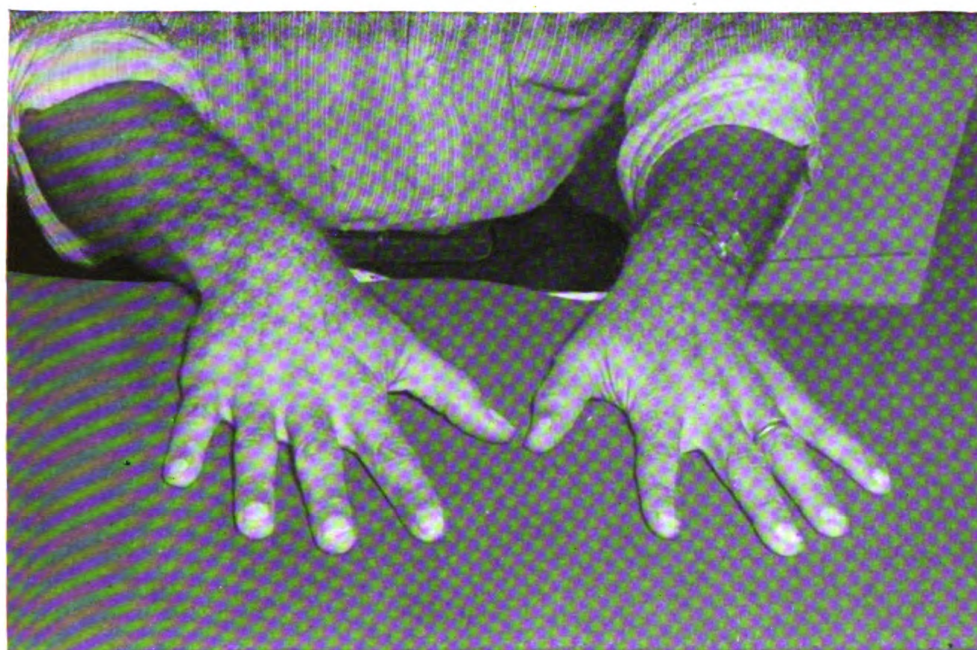


Figure 1.—Appearance of fingernails and toenails.

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Acute Virus Hepatitis¹

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VIRUS hepatitis has been recorded in every war for the past 100 years, but it became of world-wide importance for the first time during World War II.

The disease is caused by an agent which has been shown in human volunteers to be filterable and to be present in the blood, feces, and occasionally in the urine and nasal washings of persons ill with the disease (1) (2). It has not been cultured nor has animal susceptibility to it been demonstrated; it resists 56° C. for 30 minutes, and resists drying, freezing, and storage for 14 months. Ordinary water chlorination does not inactivate it.

Lucke (3) suggests that the term virus hepatitis be adapted and that the disease be divided epidemiologically into the naturally occurring and the inoculation hepatitis variants. It is not possible to differentiate these types by clinical, pathologic, or biochemical methods. The absence of cross-immunity and the difference in incubation periods are evidence against the viewpoint of one disease with different variants. Lucke explains the difference in incubation time on the basis of difference in port of entry, modification of the virus, and existence of different but closely related strains. The epidemic form is transmitted by ingestion of contaminated water or food, and possibly by naso-pharyngeal droplet infection. Artificial transmission occurs by blood transfusion or injections of pooled serum or plasma and contaminated syringes and needles may also transmit the virus. It is contained in as little as 0.01 cc. of human plasma and so may account for the so-called post-vaccination or arsenical hepatitis; through syringes and needles contaminated with human blood. One epidemic of hepatitis in a hospital was terminated when the syringes used for obtaining blood specimens were sterilized; the explanation being that there was some retrograde flow of blood when the tourniquet was released. There are no reports of transmission by serum albumin or gamma globulin.

¹ Presented at a clinic on liver disease held at the U. S. Naval Hospital, Oakland, Calif., during the twenty-ninth annual session of the American College of Physicians, 22 April 1948.

Epidemic outbreaks are seen in conditions of crowding, poor sanitation, and improper disposal of sewage. Patients are thought to be infective 8 weeks before and 64 weeks after the onset of jaundice. The disease occurs principally in the age group from 6 to 40 years. Sex, racial, climatic, and seasonal differences are not significant in this disease.

The incubation period of infectious hepatitis or the naturally occurring variant is 20 to 40 days, and of homologous serum jaundice or inoculation hepatitis from 60 to 120 days. The prodromal or pre-icteric period is marked by constitutional symptoms which may persist for 5 to 7 days. There may be an acute febrile onset with chilliness, headache, malaise, aching, nausea, and occasionally vomiting, or a gradual onset with anorexia, nausea, and vomiting. Dark urine usually marks the beginning of the icteric phase, (which generally persists 2 to 4 weeks) during which the temperature falls. Anorexia is marked, nausea and vomiting occur, clay colored stools appear, the liver becomes enlarged and tender, and the spleen is palpable in about one-fourth of the cases. Jaundice reaches a peak in about a week and thereafter fades rapidly; the symptoms abate and the appetite returns. Tenderness in the area of the liver on jarring or movement, is characteristic and often a dull ache on walking or coughing is noted. Convalescence lasts 1 to 2 months.

In some cases jaundice increases progressively, fetor hepaticus appears, central nervous system symptoms, and acute hepatic necrosis occur and death follows. The patient may appear to be getting well when, within a short period, he becomes drowsy, listless, stuporous, and comatose; or restless, excited, and delirious. The deep and superficial reflexes may be exaggerated; speech may be scanning; muscular weakness may appear; the temperature rises; and ascites may develop. The patient dies about 10 days after the onset of central nervous system manifestations. The central nervous system symptoms are believed to be due to the loss of the detoxifying action of the liver; undetoxified substances such as ethereal sulfates, phenols, and indols act as cerebral poisons although hypoglycemia may be a minor factor.

Reports of hepatic cirrhosis apparently initiated by attacks of acute hepatitis are numerous. In addition many cases of acute hepatitis reach a chronic or subacute stage which may last for months or years.

PATHOLOGY

In acute fatal cases, the liver is soft, boggy, and reduced in size; the surface is smooth, and dark brown to purple red in color. On section the appearance is mottled and the landmarks are indistinct. On microscopic examination extensive destruction of polygonal cells is seen; the reticulum is intact; the sinusoids are preserved but are

widely distended with blood, and there is infiltration by round cells in the portal stroma and interlobular boundaries. There is early proliferation of bile ducts, and bile thrombi may be present in the smaller biliary radicals. The patients whose disease runs a subacute but fatal course present a similar picture, with new parenchymal cells in atypical patterns, biliary proliferation, and the preservation of a few normal lobules. Biopsy material obtained from patients who survive shows similar but less extensive lesions. In the majority of cases of recovery, biopsies after recovery show quick repair of damage and no residual abnormalities.

Jersild (4) and other Danish workers have reported cases of hepatitis in women in the post-menopause, who died after a prolonged illness. At necropsy the liver was found to be atrophic.

It is believed that damage to the liver precedes the first clinical symptoms of hepatitis. The duration and the severity of the jaundice is not an accurate index of the extent of damage to the liver. Regional lymphadenitis and nephrosis may accompany hepatitis.

Preventive measures include isolation of patients, great care in selection of blood donors (8), abolition of the use of pooled plasma and serum, and careful sterilization of all syringes and needles used on patients for any purpose. In the presence of an epidemic Stokes and Neeffe (5) and Havens and Paul (6) have shown that the disease may be prevented or attenuated by the use of 0.15 cc. per kilogram of gamma globulin. Gamma globulin is of no value after the onset of the disease.

The important therapeutic measures include rest in bed, a high protein and high carbohydrate diet, with the addition of vitamins, and Brewer's yeast (dose 60 grams daily) as a desirable source of B complex. Hoagland and Shank (7) recommend methionine, choline, and liver extract in addition to diet and absolute rest. The minimum period of rest in bed should be 6 weeks. In severe cases with marked anorexia, parenteral casein hydrolysate and dextrose appear to be of value. At this hospital the diet prescribed for patients with hepatitis contains 150 grams of protein and has a caloric value of 3,000. Sufficient fat to make the diet palatable is given. The diet is supplemented by A-D concentrate (10,000 units of vitamin A and 2,000 units of vitamin D); ascorbic acid (50 mg.), Brewer's yeast (60 gm.), and vitamin K precursors (4.7 mg.); 9.0 gm. of choline chloride is usually administered daily.

CASE REPORT

J. P. J., a 20-year-old white male, was admitted on 19 March 1947 complaining of jaundice, nausea and vomiting, pruritus, dark urine, and light stools of 3 weeks' duration.

His present illness began about 23 February 1947 with marked lassitude and nausea; he had vomited 3 times. Three days after onset he noticed that his urine was very dark and was told that his eyes and skin were yellow. Pruritus was present. He had a low grade fever which persisted for a few days. Jaundice increased and his icterus index was found to be 39 on 1 March, and 154 on 17 March. As the jaundice deepened, his stools became noticeably white.

The patient had had gonorrhea in 1943 and syphilis in 1945. He was treated with penicillin and had received a 4-month course of arsenic and bismuth.

Physical examination on admission revealed a listless jaundiced white male. Temperature 98° F.; pulse, 70; and respirations 18. The skin, sclerae, and visible mucosal surfaces were markedly jaundiced. The liver was palpable 3 cm. below the costal margin and was symmetrically enlarged, firm, and not particularly tender. A few moderately enlarged axillary and inguinal lymph nodes were present.

The laboratory findings were: Kahn test, 3 plus; urinalysis, negative; icterus index, 100 units; thymol turbidity, 3 units; brom-sulfalein, 26 percent retained in 45 minutes of a 5 mg./kilo dose; total serum protein, 7.3 gms. percent, A/G ratio of 1.5:1; blood count and erythrocyte sedimentation rate, normal; cephalin cholesterol flocculation, 2 plus; and serum cholesterol, 78 mg./100 cc. with 33 mg. percent cholesterol esters.

His Kahn tests remained positive on repeated examination, but the syphilologist believed that previous therapy had been adequate.

Further laboratory studies showed:

20 March 1947: Liver biopsy (fig. 1).

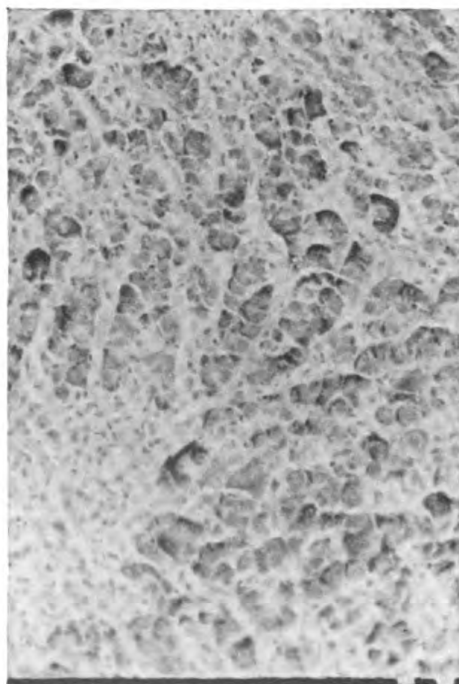


Figure 1.—A representative area of the first specimen, obtained 20 March 1947. (×130).

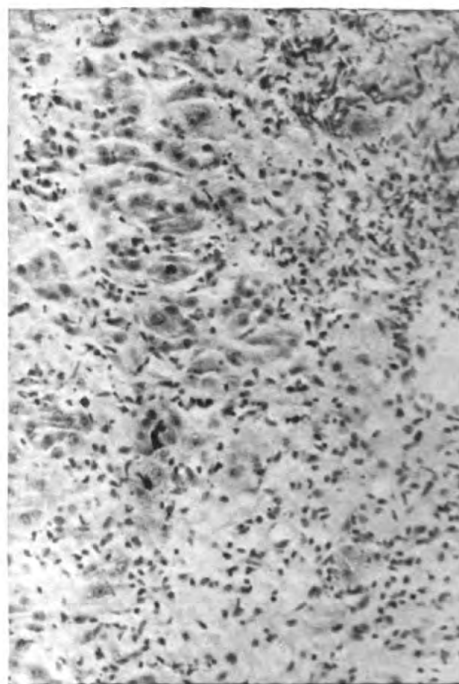


Figure 2.—A representative area of the second specimen, obtained 3 April 1947. (×130).

25 March 1947: Glycogen storage test; 6 mg. percent rise in blood sugar after injection of 0.01 cc. 1:1,000 epinephrine per kilogram body weight.

28 March 1948: Icterus index, 115; serum proteins, 7.2, A/G 1.1:1.

1 April 1947: Icterus index, 110; serum proteins, 7.2, A/G 1.4:1, cephalin cholesterol flocculation, 3 plus; thymol turbidity, 0.8, brom-sulfalein, 30 percent

3 April 1947: Liver biopsy (fig. 2).

14 April 1947: Glycogen storage test, 48 mg. percent rise.

23 April 1947: Icterus index, 30; cephalin cholesterol flocculation, 1 plus; thymol turbidity, 5.5; brom-sulfalein, 15 percent; serum alkaline phosphatase, 5.1 Bodanski units; cholesterol, 180 mg. per 100 cc.; esters, 137 mg.

25 April 1947: Icterus index, 24; cephalin cholesterol flocculation, 2 plus; serum proteins, 7.9, A/G 1.8:1; thymol turbidity, 4.2; brom-sulfalein, 10 percent.

12 May 1947: Thymol turbidity, 6.3.

13 May 1947: Liver biopsy (fig. 3).

9 June 1947: Icterus index, 15; total proteins, 7.9, A/G ratio 1.5:1; cephalin cholesterol flocculation, 1 plus; brom-sulfalein, 0 percent; alkaline phosphatase, 4.3.

10 July 1947: Glycogen storage test, 47 mg. percent rise; serum bilirubin, 0.44 mg. percent; brom-sulfalein, 0 percent; and cephalin cholesterol flocculation, 1 plus.

Treatment.—The patient was given, for the first 2 weeks, sweetened fruit juice, crude liver extract, vitamin concentrates, and parenteral casein hydrolysate with dextrose (150 gm. enzymatic hydrolysate, 300 gm. dextrose daily).

Subsequently he was given a high protein, high carbohydrate diet, and choline chloride (9.0 gm.).

Course.—The jaundice cleared slowly and had disappeared by 13 May. His liver was no longer palpable on 16 June. He was discharged on 19 July 1947 with no evidence of jaundice, liver not palpable, and normal laboratory studies.

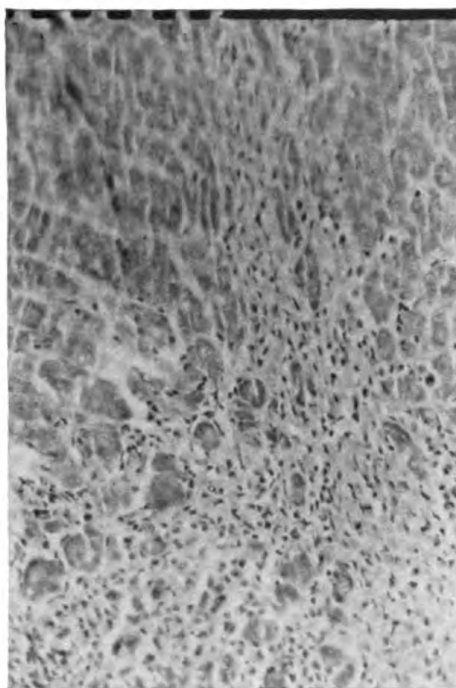


Figure 3.—A representative area of the third specimen, obtained 13 May 1947. ($\times 130$).

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Infectious Mononucleosis

Report of a Case Following Herniorrhaphy

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INFECTIONOUS mononucleosis is a contagious disease of unknown etiology. The clinical manifestations and course are subject to wide variation but usually include fever, headache, malaise, pharyngitis, and cervical lymphadenopathy. A more generalized lymphadenopathy and splenomegaly are also common. Some cases show a maculopapular or roseolar skin eruption. Although the fever may be high, extreme prostration is unusual. Occasionally there is jaundice.

The diagnosis is established by laboratory studies. Blood counts and smears characteristically show an absolute or a relative lymphocytosis, with the presence of many large, abnormal lymphocytes. These cells have a basophilic, vacuolated cytoplasm, abundant in quantity, and a nucleus which stains darkly and coarsely (1). To differentiate these cells from the lymphoblasts of lymphatic leukemia may be difficult; however, Downey and McKinley (2) and Downey and Stasney (3) state this can be done by careful study of the cells, particularly of the intranuclear structure. During the course of the disease heterophile antibodies develop in the blood of the patient; the agglutination of sheep erythrocytes with the patient's serum has been developed as a specific diagnostic test by Paul and Bunnell (4). A false positive blood Wasserman test occurs in some cases and may confuse the diagnosis.

The prognosis is excellent. The febrile episode is self-limited, and fatalities are very rare (5). There is no specific treatment; the therapy consists of supportive and symptomatic measures.

The case reported here is of interest because it illustrates the problem of the differential diagnosis of febrile post-operative complications, because it was atypical and unusually severe, and because it emphasized the importance of careful pre-operative study of the surgical patient, even while underscoring the limitations of such study.

CASE REPORT

A 20-year-old seaman was operated on for an indirect right inguinal hernia. He had been under medical observation for 3 weeks before operation and was apparently in excellent general health. Physical examination before operation revealed no abnormality other than the hernia. Routine laboratory studies, done a few hours before operation, revealed an erythrocyte count of 5,750,000 cells per cu. mm.; a white blood cell count of 5,650 cells per cu. mm., with a differential count of 48 percent segmented neutrophils, 7 percent bands, 44 percent lymphocytes, 1 percent monocytes, and 1 percent eosinophils; and a blood-clotting time of 4 minutes (by a single-tube method).

Surgical repair of the hernia, employing the Andrews' modification of the Bassini operation, was done under procaine spinal anesthesia. The fascial structures were noted to be flimsy. There was unusual bleeding, in the form of capillary oozing, during the operation. Prior to closure of the wound, however, a satisfactory hemostasis was achieved. The immediate post-operative condition of the patient was excellent. About 12 hours after operation the patient noted a small swelling in the right groin; during the next 4 hours this became progressively larger and extended into the scrotum. Examination revealed a moderately large hematoma at the site of the operative wound. Eighteen hours after the herniorrhaphy, a second operation was done, this time under intravenous pentothal anesthesia. The original incision was reopened, and the wound explored down to the aponeurosis of the external oblique. An actively bleeding subcutaneous vein was found and ligated. A number of large blood clots were removed from the subcutaneous tissues. A drain was inserted down to the muscular layer, and the wound was again closed. Post-operatively the administration of penicillin, 100,000 units intramuscularly every 3 hours, was begun. The blood-clotting time was rechecked and found to be $3\frac{1}{2}$ minutes; the bleeding time was 3 minutes. Despite these normal findings, the patient was given 5 mg. of a vitamin K preparation intramuscularly, and this dose was repeated daily for 3 days.

No further bleeding occurred at the site of the operation. On the day of the second operation, the temperature rose to 101° F. A temperature elevation of about that degree was maintained for 4 days. The drain was removed 72 hours post-operatively; no purulent drainage was noted. Only a slight amount of tenderness about the wound was evident.

On the third day after the second operation the patient, although running a low grade fever, seemed to be progressing satisfactorily. He was voiding, eating a soft diet, and taking fluids orally. The legs seemed normal. A chest roentgenogram was negative. Urinalysis was normal. The leukocyte count was 5,500, with a differential count of 56 percent segmented, 42 percent lymphocytes, and 2 percent monocytes. No abnormal cells were noted on the blood smear.

In the evening of the fourth post-operative day the temperature rose to 104.2° F. Physical examination revealed a mild congestion of the pharynx. Tender, discrete lymph nodes, the size of lima beans, were felt in the right and left sides of the neck and in the left axilla. Lungs and heart were normal to percussion and auscultation. The abdomen was negative, except for a slight amount of tenderness in the region of the operative wound. The spleen could not be palpated. Insertion of a hemostat into the wound, down to the muscular layer, yielded no pus. In the right half of the scrotum there was moderate tenderness and induration about the right epididymis; this, however, did not seem adequate to explain the fever. The legs were normal. No signs of meningismus were detected. The leukocyte count was 4,800, with a differential count of 65

percent segmented, 4 percent bands, and 31 percent lymphocytes. A few of the lymphocytes were large, with an indented nucleus and a vacuolated cytoplasm. No definite diagnosis could be made at that time. The patient was already receiving penicillin. The administration orally of 1 gm. of sulfadiazine, together with 1.2 gm. of sodium bicarbonate, every 4 hours was now begun.

During the next 4 days the temperature was extraordinarily labile, rising rapidly within a few minutes from 100° to 104° F. Efforts to reduce the fever by alcohol sponging were usually rewarded by a rapid drop of several degrees. Every day he had several spikes of temperature to 103° F. He had no chills, and despite the high fever, did not appear prostrated. Intake of food and fluids by mouth steadily declined. Repeated physical examinations showed an increasing congestion of the mucosa of the pharynx and nasal passages. There was no evidence of parotitis. The lymph glands on both sides of the neck increased moderately in size and in tenderness. The rest of the physical examination remained unchanged. A second chest roentgenogram was negative. Several urinalyses were normal. A blood culture yielded no growth.

Daily blood counts were done. On the fifth post-operative day the erythrocyte count was 3,780,000, with a hemoglobin of 11 gm./100 cc.; the sedimentation rate was 31 mm./hr. On the seventh post-operative day the erythrocyte count was 3,200,000; the blood platelet count was 28,080; and the leukocyte count was 6,200, with a differential count of 54 percent segmented, 2 percent bands, 42 percent lymphocytes, and 2 percent monocytes. Of the lymphocytes, about one-third were large and had an abundant, occasionally vacuolated cytoplasm.

Fluid intake and output were recorded; and the intake was kept above 3,000 cc. for every 24-hour period by supplementing oral intake with intravenous infusions of 5 percent dextrose in water and of 5 percent dextrose in physiological saline. Sulfadiazine, after being given for 72 hours, was discontinued. Sodium penicillin in aqueous solution was replaced by one daily intramuscular injection of 300,000 units of penicillin calcium in oil and wax. Daily injections of 10 units of liver extract intramuscularly were begun. On the seventh post-operative day he was given a transfusion of 500 cc. of whole blood.

The diagnosis still remained obscure. Repeated examinations failed to reveal evidence of any of the complications which commonly produce fever post-operatively. The relatively low leukocyte count, persisting despite the fever, seemed inconsistent with most of the possible bacterial infections. Lymphadenopathy was not generalized. The percentage of lymphocytes in the differential leukocyte count was only slightly higher than normal. The anemia, high sedimentation rate, and low blood platelet count were all thought to be more suggestive of an acute "aleukemic" leukemia than of infectious mononucleosis (6).

On the ninth post-operative day he developed a generalized maculopapular skin eruption on the face, neck, arms, body, and legs. It was erythematous, but not petechial. He appeared desperately ill. There was an annoying obstruction of the nasal passages with a thick mucous exudate. The temperature rose that afternoon to 105.6° F. He could take nothing by mouth. The erythrocyte count was 3,350,000.

On the tenth post-operative day his condition continued to be very serious. He was apathetic and, at times, irrational. The temperature fluctuated between 102° and 104° F. A subconjunctival hemorrhage of the left eye appeared. The erythrocyte count was 3,460,000. The total and differential leukocyte counts remained essentially unchanged. He was given another transfusion of 500 cc. of whole blood. Agglutinations for typhoid, paratyphoids A and B, brucella melitensis, Proteum OX19, Proteus OXK, and Proteum OX2 were all negative.

On the eleventh post-operative day he seemed definitely better. The temperature declined to 101° F. and remained at that level all day. He received another transfusion of 500 cc. of whole blood.

During the next 2 days the temperature continued to decline; and on the fourteenth day, it was normal for 24 hours; the rash faded; and the enlarged cervical and left axillary lymph glands decreased in size. The throat remained sore; a dirty gray exudate covered the tonsils and pharyngeal mucosa; and a thick mucous discharge blocked the nasal passages. Blood studies showed an erythrocyte count of 5,250,000; a hemoglobin of 13.5 gm./100 cc.; a leukocyte count of 6,580, with a differential count of 25 percent segmented, 1 percent bands, 70 percent lymphocytes, and 4 percent monocytes; and a sedimentation rate of 9 mm./hr. A heterophile agglutination test was reported positive in dilution of 1:320. For the preceding 10 days almost all nourishment and fluid intake had been in the form of intravenous infusions. The urinary output was good, and he had neither edema nor dehydration. However, he had lost 30 pounds of weight.

After the fourteenth post-operative day the patient remained afebrile. Penicillin was discontinued after a few days of normal temperature. The rash disappeared entirely, and the lymphadenopathy slowly subsided. The operative wound healed well. The right epididymitis disappeared. The appetite returned, and he took both liquids and solid food by mouth. He became ambulatory 21 days post-operatively.

Six weeks after operation the heterophile agglutination was still positive in a dilution of 1:224. A relative lymphocytosis persisted. The blood Kahn test remained negative throughout the entire period of observation. He slowly regained weight and strength and returned to duty 2 months after operation.

COMMENT

This febrile episode was a perplexing diagnostic problem. During the first 3 post-operative days it was thought, in view of normal findings in physical examinations and laboratory studies, that the moderate elevation in temperature was probably due to an aseptic inflammatory process. After the third day, and with the development of higher temperatures, this explanation became progressively more improbable. In the search for the cause of the patient's fever, attention was focused upon the operative wound, the lungs, the urinary tract, the legs, and the parotid glands and ducts; however, no evidence of infection or thrombosis in these regions could be found. The persistently low leukocyte count seemed significant and directed attention toward a systemic disease. The differential leukocyte count continued throughout almost the entire febrile period to show very little increase above normal in the percentage of lymphocytes.

The large abnormal lymphocytes were not noted in early blood smears and for several days after they were first noted, were not numerous. The anemia, low blood platelet count, and high sedimentation rate were all regarded as evidence against a diagnosis of infectious mononucleosis. For several days it seemed that acute "aleukemic" lymphatic leukemia was a more probable diagnosis. The heterophile

antibody test, which was not available until after the crisis of this illness had passed, and the subsequent course of the disease established the diagnosis.

The relationship in this case between the surgical procedure and the infectious mononucleosis is not entirely clear. It seems most probable that the patient was in the incubation stage of the disease at the time of operation and that the surgery, by lowering his resistance, may have been partially responsible for the unusual severity of the disease.

Although the clinical history and the routine laboratory tests which were done before operation did not, in this case, provide reason to suspect that such a post-operative complication might occur, it is felt that this experience does not belittle, but rather emphasizes the importance of careful pre-operative study of the surgical patient. Careful history taking, physical examination, and blood and urine studies offer the best practical means of detecting patients who are in the incubation period of a communicable disease, as well as those who are poor surgical risks because of diabetes, or impaired function of the heart, lungs, liver, or kidneys.

SUMMARY

1. A case of infectious mononucleosis occurring in the post-operative period following a herniorrhaphy is presented.
2. The onset of this disease shortly after operation, the absence of a characteristic hematological picture during the early part of the disease, and the unusual severity of this case produced a difficult diagnostic problem.
3. The importance of careful pre-operative study of the surgical patient is emphasized.

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Tsutsugamushi Disease

Report of a Case

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IN THE literature available to the authors no proved case of tsutsugamushi disease has been reported in China. In fact a Bureau of Medicine and Surgery publication states: "Although tsutsugamushi disease was probably known in China in the third century A. D. there are no absolutely authentic records of its occurrence in modern China" (1). However, this publication states that the disease may possibly occur there. It is a well-known fact that this malady is frequently seen in Japan, Formosa, Sumatra, the Malay States, and the Philippines under such names as scrub typhus, Japanese river fever, and mite typhus. From an epidemiological standpoint, it appears that the disease may have wider distribution than heretofore supposed.

The insect vector for the *Rickettsia tsutsugamushi* is ordinarily thought to be the larval mite of *Trombicula akamushi* and *Trombicula deliensis* (2) (3). In Japan at least, the reservoir host is a species of field mouse (4). However, some investigators, depending on their location, have incriminated other animals such as cats, dogs, and cattle as intermediate hosts (5). This point is noteworthy since it was later discovered that one of several dogs in the patient's immediate neighborhood had a blood OXK titer of 1:80, while the other dogs had negative reactions to this antigen.

The disease entity, its variations, pathology, prophylaxis, and treatment have been previously described by other authors (4), (6), (7), (8).

CASE REPORT

A 26-year-old white medical officer was admitted to the U. S. S. *Repose* on 17 July 1948 complaining of retrobulbar aching and generalized headache which had begun some 6 days before. Of lesser annoyance but of like duration were complaints of chilliness and a nocturnal temperature rise to 103° F. With each rise in his temperature the patient had a slight nonproductive cough and periorbital edema. Early in his illness he had noted several shallow painful ulcers at the base of his tongue. The night before admission he had been aware of "blepharitis and a definite periorbital edema" which persisted for several days.

There was no known exposure to infectious diseases. It is noteworthy however, that the week prior to his present illness the patient had been on maneuvers with the Marine Corps in the Chinese Province of Shantung. Other past history and family history were not contributory.

Physical examination revealed a husky young white male who appeared moderately acutely ill. Vital signs at the time of admission were normal. Several fading macular erythematous lesions of the neck and shoulders were noted. There were several slightly tender discrete lymph nodes palpated in the right cervical chain. Showers of petechiae were seen bilaterally on the buccal mucosa. Except for the tambour quality of the aortic second sound no other abnormalities were noted.

The patient's clinical course in the hospital was at first one of great discomfort due to the formation of ulcerative lesions on the soft palate and the tonsillar pillars. For the first week he had a remittent but generally elevated temperature with a concomittantly rapid pulse. On the day following admission a pustular lesion was noted in the right submandibular region and it was felt that the right cervical lymphadenopathy might well have stemmed from that source. A typical black eschar was not observed. Treatment consisted of measures to relieve pain and to maintain adequate nutrition. Penicillin was administered for a period of 48 hours as a prophylaxis against secondary infection in the respiratory tract. The patient steadily improved and remained afebrile after the first week of hospitalization. He was considered completely recovered 5 weeks after admission and returned to duty.

Laboratory findings on admission were a white blood count of 5,750 with a normal differential red blood cell count and hemoglobin. Urinalysis, stool examination, blood culture, and Brucella and Widal agglutinations revealed no abnormalities. The erythrocyte sedimentation rate (Cutler method) was 11 mm./1 hr. The blood Kahn test showed a 4+ reaction. The Well-Felix test showed a negative agglutination against *Proteus* OX19, but a positive titer of 1:1,280 against OXK. By the third hospital day this titer rose to 1:2,560, and ultimately showed a gradual decline until 3 weeks later a value of 1:320 was obtained. Both the white blood cell count and the sedimentation rate showed slight elevations during the course of the disease, but they returned to normal in a month's time. The Kahn test also reverted to a negative value. Chest roentgenograms and repeated electrocardiograms revealed no abnormalities at any time.

DISCUSSION

One of the atypical features which seems worthy of mention in this case is the presence of the petechial lesions on the buccal mucosa. According to Stitt (4) such a picture is rarely seen. However, the showers of petechiae in our case were a definite feature as were the painful ulcerations of the soft palate. This is not surprising when one considers the fundamental pathology of the disease. As described by Settle et al (6) this is an "acute generalized inflammation of the vascular lining, vascular wall, and perivascular tissue." In the autopsies performed by this group of investigators, punctate hemorrhages of all serous surfaces were common.

Information regarding the false positive serological reaction, particularly in the Kahn test, was not available. However, it was learned

from Stokes (9) that biologic false positives were frequent in typhus and spotted fevers; and further that such reactions disappear in convalescence. Such was the course of events in our case of scrub typhus.

Recently there have been favorable reports on the use of such specifics as paraminobenzoic acid (10) and Chloromycetin in the treatment, if started early in the course of the disease. Although neither of these drugs was available to us it is unlikely that they would have materially influenced the course in our case since diagnosis was established 1 week after onset.

SUMMARY

A case of tsutsugamushi disease (scrub typhus) is presented. Among the unusual features encountered were: (a) the petechiae on the buccal mucosa; (b) the presence of a positive Weil-Felix, OXK, in the patient's dog; and (c) the important epidemiological fact that this is the first authenticated case, to our knowledge, that has been reported in China.

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Pyloric Stenosis in Binovular Twin Boys

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IN MARCH 1947 Laubscher and Smith (1) reviewed the literature on hypertrophic pyloric stenosis in twins and came to several interesting conclusions. It was determined that when a monovular twin is affected, the other twin will usually be affected also. There have been 2 exceptions in 13 reported cases. It was also determined that if a binovular twin is affected, the other twin is not likely to be affected and to date there were only 2 exceptions in 23 sets of binovular twins reported. A third exception is reported in this article.

In 1,664 cases of pyloric stenosis (2) (3) (4), there were 41 twins affected in 38 sets, a ratio of 1:39.6 or 1 twin in 40.6 cases. This is about the same ratio as found in single births and it seems no more likely for twins to be affected than singly born infants.

The evidence of a genetic factor has never been proved, but there are instances reported where siblings in successive generations have been affected, as well as the proved and frequent occurrence of both children of a monovular source being affected.

CASE REPORT

Frank and Christian H. were male twins born of a 30-year-old white female, gravida 2, para 0, who had a normal prepartum course until 7 weeks before delivery, when she began to have symptoms of preeclampsia. The severity of the toxemia became progressively worse and the edema, hypertension, and albuminuria did not improve with conservative therapy. Roentgenogram revealed twins and 6 days beyond the expected date of delivery labor was induced and lasted 10 hours. The first baby, a frank breech presentation, was delivered under saddle block anesthesia. The second baby, a vertex presentation, was delivered by internal podalic version. Both children responded well. The placentae were joined by a large isthmus and the two sacs apparently had one common surface with a double layer of chorion and amnion, confirming the origin as binovular.

Frank, being the smaller child, was put on breast and supplementary feedings. Christian was put on formula feeding. Both children nursed well; Frank weighed 6 pounds, 4½ ounces at birth, and 6 pounds, 8 ounces at discharge on the sixth day. The breast feeding went well but there was not

enough to satisfy him so he was continued on supplemental feedings. Christian weighed 7 pounds, 9¼ ounces at birth and 8 pounds, 1¼ ounces at discharge on the sixth day. Both children were discharged in apparently good condition.

Thirteen days later Frank was admitted to the hospital with a rectal temperature of 100° F. The mother noted vomiting, cyanosis, and constipation in the child. Vomiting had begun about 7 days previously and had become progressively worse; more frequent, and occasionally projectile in nature. Visible peristalsis was seen and a mass felt on one occasion. Breast feedings were stopped and the child was given thickened feedings and atropine sulfate (1 : 5,000 dilution; increasing the number of drops every 3 hours until flushing appeared when the child received 7 drops). This regime was supported by clyses of glucose and saline.

Roentgenogram of the chest after hospitalization showed no signs of thymic enlargement or pathologic lung changes. A gastro-intestinal tract roentgenogram following a barium-water mixture by mouth revealed gastric dilatation, hyperperistalsis, a large gastric residue, and failure of the small intestine to fill 4 hours after ingestion of the barium-water mixture. Fluoroscopically the pyloric canal was rigid and narrow.

On the seventh day following admission, under ether anesthesia, a pyloroplasty (Fredet-Rammstedt) was done through a right, subcostal oblique incision, exposing the enlarged pylorus. On palpation the pylorus was cartilaginous and when incised it was found to be fibrous in consistency and about 0.5 cm. deep and 2 cm. long.

The post-operative course was uncomplicated and feedings were retained without difficulty 4 hours after the operation. The child immediately began to gain weight and has continued to do so.

Christian was admitted to the hospital 3 days after his brother, Frank. The complaint was the same. This baby had been a bottle-fed baby and the larger of the two at birth. Conservative treatment was again tried.

A gastro-intestinal roentgenogram following barium-water mixture by mouth showed almost the same findings as in the case of his brother except that slightly more barium passed the pylorus into the small intestine at the end of 4 hours. There was at least a 75 percent gastric residue at that time although some of the barium-water mixture had been regurgitated. Visible peristalsis was present and there was some question of a palpable mass.

On the fifth day after admission a pyloroplasty (Fredet-Rammstedt) was done and the findings were exactly as those found in his brother. This child also made an uneventful recovery and was discharged on the seventh post-operative day with an increase in weight and no vomiting.

COMMENT

In seeking possible causes for hypertrophic pyloric stenosis, Stolte (5) postulated that the female hormone transmitted via placenta or mother's milk might cause pathologic changes in the pylorus. This idea was disproved by the occasional occurrence of a female child of binovular birth being affected, while the male child was unaffected. In the case reported here, however, both children are males of a binovular birth and seem to support Stolte's concept. Not only that, but the child first showing symptoms was the baby that was breast-fed and in turn showed slightly greater pyloric stenosis.

Ford, Brown, and McCreary (3) suggested that environment imposed before birth might have an effect inducing pyloric stenosis. They based their idea on the false assumption that twins were affected more frequently. However, in the case presented, the severe preeclampsia of the mother before delivery certainly provided an unnatural environment.

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Congenital Talipes Equinovarus

Treatment With the Modified Denis Browne Splint

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THE Denis Browne splint "depends on the mechanical principle that it is possible to control the position of one foot by means of the other" (4), and the infant corrects his own deformity by his kicking. "By correcting the position of the foot and keeping it at rest, structure alone is treated. To correct function, the two most important divisions of which are the muscle balance of the foot and the mental impression of how it should be used, it is necessary to allow (and even to stimulate) movement in the corrected position. The classic methods of splinting talipes ignore function." (4)

With Denis Browne splints there is functional correction as well as structural correction of the deformities. It is an active correction as opposed to the passive correction of plaster casts. Muscle tone is maintained, and there is avoidance of the atrophy so often seen in other forms of treatment. It is relatively free of injuries to the skin commonly associated with plaster casts. The flexibility and the normal appearance of the feet following treatment with Denis Browne splints are striking features.

Bell and Grice (1) presented an article on the treatment of club feet with Denis Browne splints in which a modified type of foot plate and a method of strapping was described. Essentially this same type of splint is used at this hospital and was made by a patient in the occupational therapy department.

The footplates (fig. 1) are fashioned from plexiglass, a light but sturdy material. A longitudinal arch is molded into the plate as a partial aid in developing the foot's arch and in preventing a "rocker-bottom" deformity. The plate is somewhat wedge-shaped, the base of the wedge being on the lateral border. In an attempt to better control the foot adduction there is a very slight convexity of the medial border of the plate and a slight concavity of the lateral border as advised by Blumenfeld, Kaplan, and Hicks (2). There is a lateral flange on the foot piece which fits against the infant's heel just distal to the malleolus. This flange is high enough to serve its important purpose of holding the heel to the outer edge of the plate, yet low enough so that it does not strike the lateral malleolus even when the

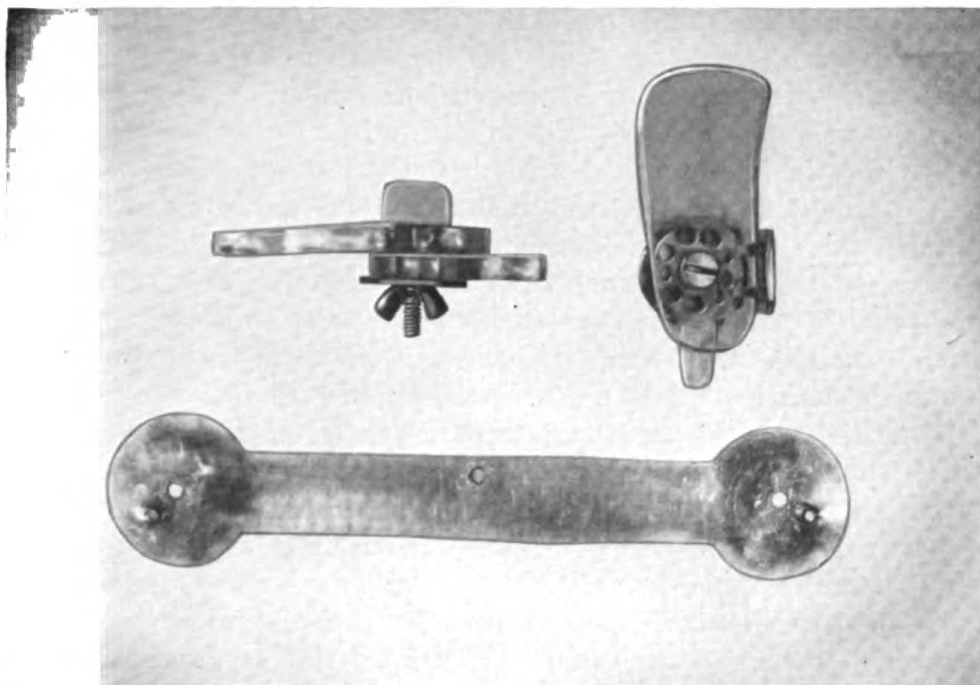


Figure 1.—The Denis Browne splint. Note shape of fore part of plate and longitudinal arch in lateral view. Pin on bar and sockets on under surface of plate into which pin fits are also shown.



Figure 2.—Splint strapped to infant's feet. The condition is almost completely corrected after 11 weeks of treatment.

foot is in marked valgus position. The flange is covered with soft felt to avoid injury to the skin. On the bottom of the plate there is the usual device consisting of sockets into which a pin on the connecting bar fits, to hold the foot in the desired degree of rotation.

The duraluminum bar which connects the feet is made in 3 lengths ($7\frac{1}{2}$, $8\frac{1}{2}$, and 10 inches (from hole to hole)), according to the size of the child. It is malleable enough to permit bending as correction progresses, but strong enough not to bend as the child kicks. A small hole is drilled in the center of the bar to allow the entire apparatus to be suspended from a crosspiece on the child's crib, thus keeping the infant's feet off the bed where he can kick at will.

It is desirable to begin treatment as early as possible—patients who are untreated for a year or more are relatively poor candidates for correction by Denis Browne splints. When the infant is born at this hospital, treatment is begun in the first week by gently manipulating the foot several times a day. Also, in those cases which are not seen until they are several weeks or months old, this preliminary period of manipulations is very desirable. After this period, treatment with the Denis Browne splint is begun.

The strapping is done following the principles of Bell and Grice with emphasis on "strapping the plate to the foot." The first two tapes are applied carefully to oppose the foot adduction—particular attention is paid to the tapes which embrace the heel. The tip of the os calcis is caught with each heel tape and every effort is made to see that the heel fits snugly against the plate. This is of extreme importance in the prevention of "rocker-bottom" deformity. Care is taken to see that there are no wrinkles in the tapes or the skin which is caught in the tapes. It is important to avoid windows between the tapes through which the skin would bulge and become edematous. A narrow piece of thin soft felt is placed under the second strap as it is carried across the dorsum of the foot. One or two cases will teach the physician how tight to strap the foot so that it fits firmly on the plate without interfering with circulation.

The splints are changed 5 days after the first application. If progress is satisfactory, the child is examined at weekly intervals. The parents are cautioned and instructed to look for evidence of impaired circulation and to see that the heel remains down against the plate. If anything untoward occurs they are told to bring the child to the clinic immediately; or, if that is impossible they are to remove the plates from the child's feet and come to the clinic the next day.

On the morning of the regular visit, the mother removes the plates and adhesive strapping, bathes the feet, and applies talcum. (No oil should be used because it is difficult to remove and interferes with adhesive strapping.) This allows the skin several hours to "air-out."

Before the splint is restrapped, his feet are gently manipulated and the skin painted with compound tincture of benzoin.

Progress is followed clinically (fig. 2) and roentgenographically (fig. 3), and active treatment is continued until full correction is shown by both examinations. This is important in the prevention of recurrences, which are often more difficult to treat than the original deformity.

We have used the standard of minimal correction advised by Bell and Grice, before considering a foot clinically corrected. There must be at least 30° of passive dorsiflexion at the ankle, and the foot at rest must maintain a position of slight external rotation.

Roentgenographically, we have followed Kite's (5) rules and have considered the foot adduction uncorrected until the talus points toward the great toe instead of toward the little toe.

In the antero-posterior roentgenogram of the club-foot, the mid-lines of the talus and calcaneus may coincide, be parallel, or form an extremely sharp angle, caused by the supination of the calcaneus under the talus. Therefore, correction of the varus deformity must be continued until these two bones form an angulation of 30° to 35° (fig. 4).

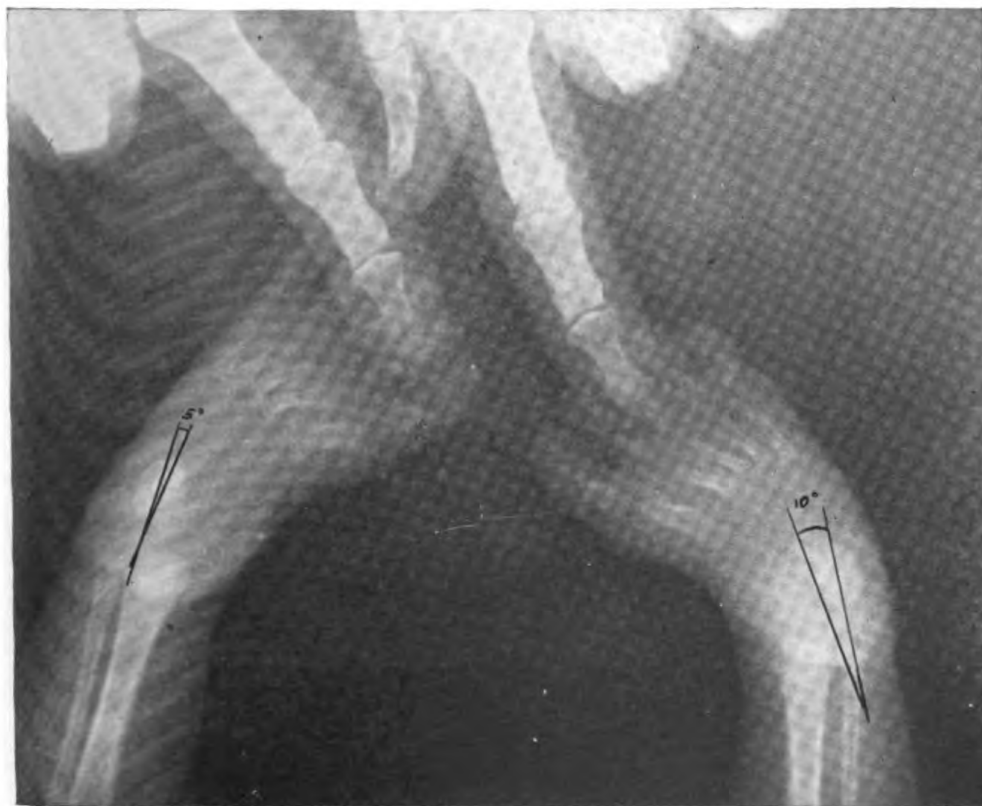


Figure 3.—Roentgenogram taken at start of treatment.

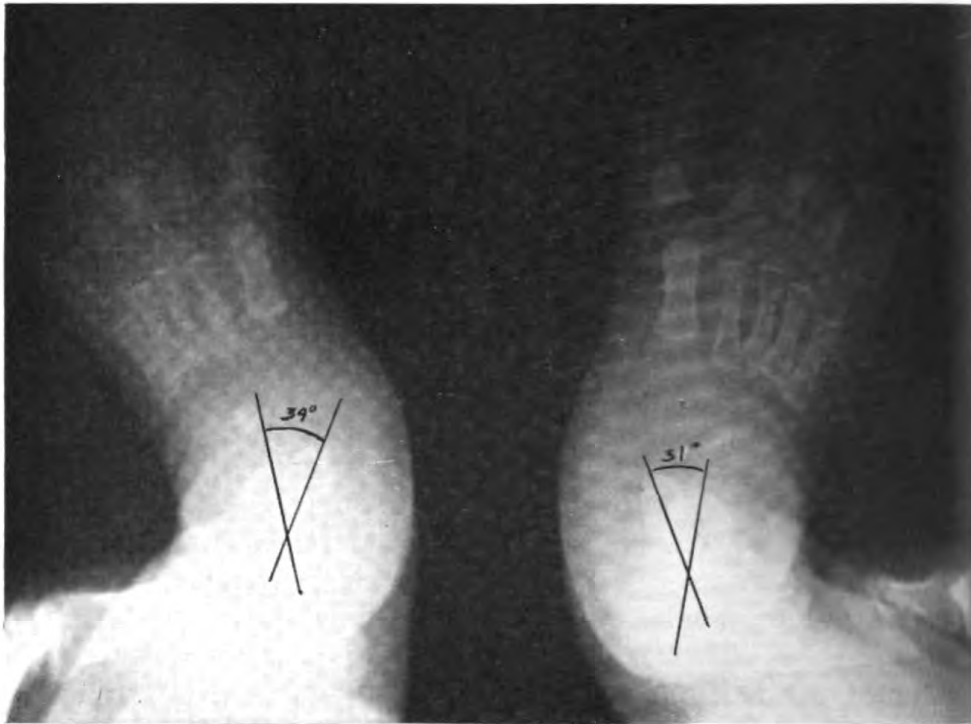


Figure 4.—Roentgenogram taken after 11 weeks of treatment. The talus is now pointing toward the great toe. The midlines of talus and calcaneus now form an angle of about 30° to 35°.

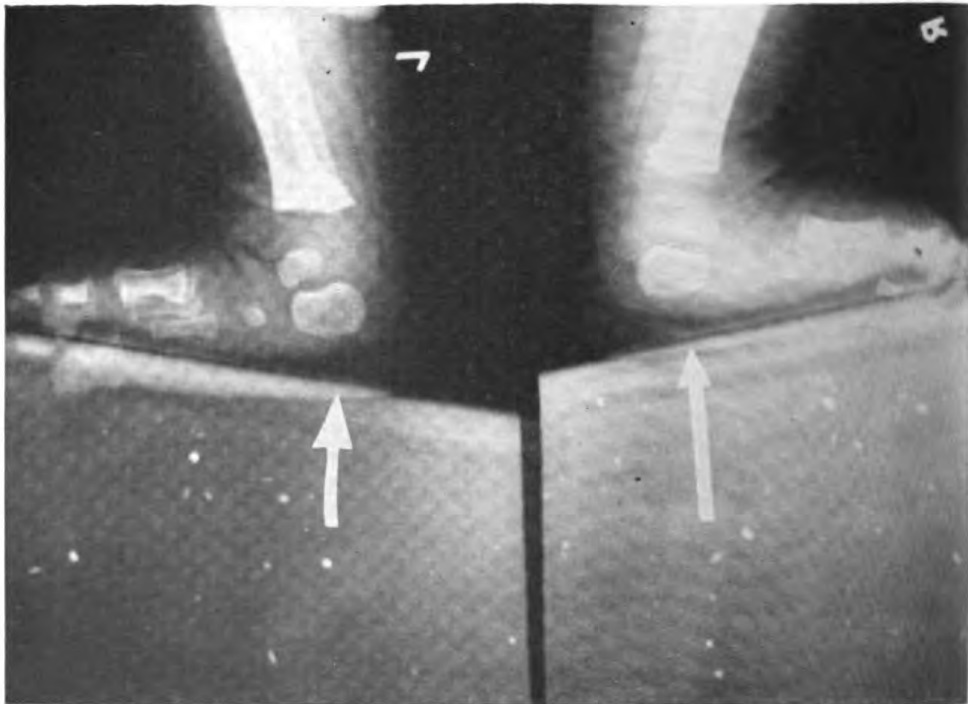


Figure 5.—The equinus is still not quite corrected, as shown by the relative positions of the talus and calcaneus.

The correction of the equinus deformity is followed by the lateral roentgenogram, in which the talus should not extend significantly over the calcaneus (fig. 5), but in which the anterior ends of the two bones should be in practically the same transverse plane if treatment has been successful.

The maintenance of correction is of great importance. At this hospital we use the splints for a prolonged period after correction has been obtained. When the child is old enough to be fitted with shoes which grip the feet securely, the shoes are riveted to the plates and then used with the bar as before. To control the foot, the left shoe is used on the right foot, and the right shoe on the left foot, as suggested by Blumenfeld, Kaplan, and Hicks. It is imperative, however, that the shoe fits so well that the foot does not turn into the varus position or the heel pull up into equinus within the shoe.

NOTE.—The author wishes to express his appreciation to C. H. Rinebarger, CBGMSTR, U. S. N., for his assistance in the construction of the splints; and to R. A. Bartlett, HA1/c, U. S. N., and to D. W. Lievan, BKR2/c, U. S. N., for the photography.

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Plastic Repair of Surface Defects in Preparation for Bone Grafting

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THE PROBLEM of replacing scarred and devitalized soft tissue over an area of nonunion of the long bones of the extremities continues to be of interest. We daily see the results of inadequate soft tissue repair prior to bone grafting. All cases requiring bone grafting or deep tissue repair must have an adequate covering of the operative site.

By an adequate covering is meant skin, subcutaneous tissue, and fat. A bone graft, in order to survive, must have adequate nourishment and cannot survive if a thin cicatricial covering breaks down. If this problem is clearly understood much time will be saved both the patient and the surgeon. The majority of cases of nonunion requiring a bone graft result from a compound fracture complicated by infection and bone sequestration. Many have had repeated sequestrectomies and prolonged drainage of the wound area. Needless to say, such an area is healed by cicatrization.



Figure 1.—Exposed bone graft, right tibia, dehiscence of wound, 7 inches in length, over entire graft due to operating through a linear scar. The graft was removed.



Figure 2.—The upper portion of the scar has been replaced by a contigous flap. The lower two-thirds of scar area replaced by a cross-leg flap from the opposite thigh.



Figure 3.—Scar tissue has been completely excised over the lower third of the leg. The area of nonunion is now covered with a heavy pedicle flap. In 3 months this flap may be raised and a bone graft replaced between tibial fragments. This operative site should have been prepared in this manner prior to the first bone grafting.

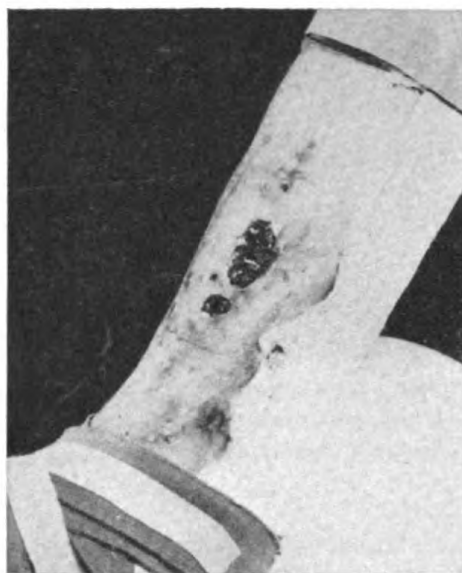


Figure 4.—Nonunion of the right tibia and fibula. Bone graft of tibia exposed due to sloughing of thin cicatricial tissue over grafting area. The bone graft was lost due to inadequate leg covering.



Figure 5.—To prepare this area for a second attempt at bone graft, the scar tissue over an area of 6 by 3 inches has been completely excised and replaced by a cross-leg pedicle flap from the left thigh. Flap is now healed and ready for detachment.

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Figure 6.—The flap has been detached and medial border sutured into position. This area will be ready for the second bone graft in 3 months.

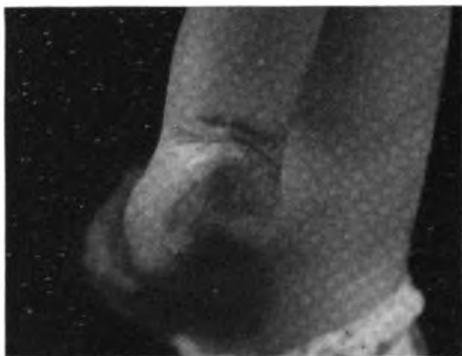


Figure 7.—Nonunion of humerus. Deep constricting scar separating humeral fragments.



Figure 8.—Scar tissue excised and replaced by a pedicle flap from the left thoraco-abdominal area.

A linear scar, penetrating to the tibial fragments and adherent to the bone, is frequently a source of post-operative dehiscence. This scar, usually a site of previous efforts to close the wound primarily, may appear innocuous. The operator in evaluating this scar feels that by making a curvilinear incision lateral or medial to the original wound, he avoids break-down in this area. In undermining over the tibial fragments, the thin scar is freed and nutritional disturbance of the scar is the result. Simple excision of a linear scar with adequate undermining of the flaps and primary closure seldom is sufficient to prepare the defect.



Figure 9.—Flap has been detached and sutured into position. Flap has been made redundant to permit extension by bone graft.

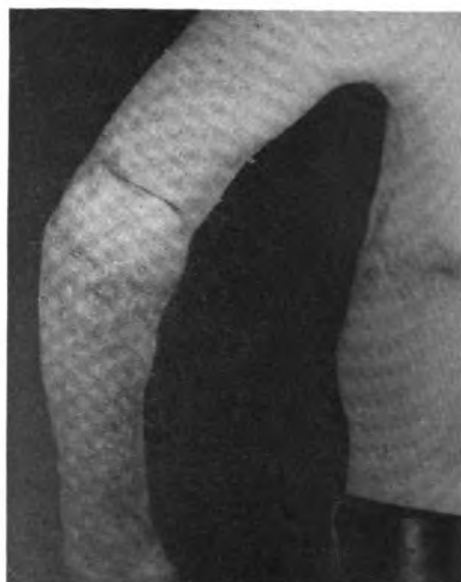


Figure 10.—Post-operative appearance of flap after completion of bone grafting.



Figure 11.—Aseptic necrosis of soft tissue over a tibial bone graft. The graft is exposed in an area measuring $1\frac{1}{2}$ by $\frac{3}{4}$ inches. Result of grafting through an inadequate surface covering.

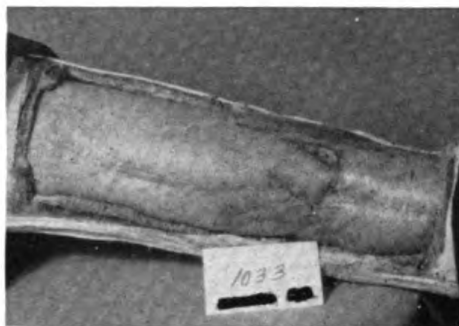


Figure 12.—Viability of the graft was preserved by covering the defect with a small contiguous flap. The donor area was covered with a skin graft.

Any scar of appreciable size deeply adherent to the bone is a distinct hazard to future bone grafting of nonunited fragments.

To prepare a cicatricial area for bone grafting many methods may be used, depending on the size of the defect and the condition of the adjacent tissues. In the lower leg where adequate tissue is available, contiguous flaps are exceedingly useful. The transposition flap is the most commonly used. This type of flap is, at times, precarious, especially in the lower third of the leg, but where the knee is limited in its motion it is, in many instances, the only method available. Where there is free knee motion a thigh flap or tube transferred cross-leg is the method of choice (figs. 1, 2, 3, 4, 5, and 6). Flaps from the inner surface of the lower leg transferred cross-leg are successful but require adequate undermining and delaying prior to transfer. Tubes raised from the abdomen and carried downward on the wrist to the lower



Figure 13.—Exposed bone graft, left tibia. Aseptic necrosis of soft tissue due to inadequate surface covering.

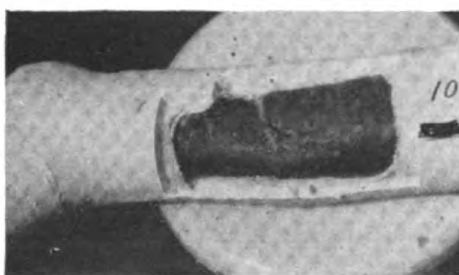


Figure 14.—The viability of this bone graft has been preserved by raising a large contiguous pedicle flap in stages, medial to the wound. The flap was transposed to cover the defect. Donor area was covered with a split thickness skin graft. Roentgenogram shows the bone graft still viable and in the process of healing.

extremity require too much time to be of great value. They are only used as a last resort. The most direct method possible of transferring a flap is naturally the method of choice.

In the upper extremity it is very simple to secure almost any type of flap or tube desired from the abdomen, chest wall, or flank (figs. 7, 8, 9, and 10).

When there is break-down of soft tissue over a fresh bone graft due to aseptic necrosis it is frequently possible to save such a graft by dressing the grafted area with normal saline dressings and raising a contiguous flap in stages adjacent to the exposed bone graft. When the wound is clean, the flap is transferred to cover the defect and the donor area covered with a split thickness skin graft (figs. 11, 12, 13, and 14).

CASE REPORTS

Cases 1 and 2 are examples illustrating replacement of cicatricial tissue to the upper extremity by pedicle flaps in preparation for future bone grafting.

Case 1.—K. W. A. suffered a supracondylar compound fracture of the left humerus on 24 December 1944 as a result of shell fragment wounds. The arm was adequately immobilized but nonunion of the fracture occurred as a result of ensuing osteomyelitis and sequestration of fragments. The wound healed after many months of treatment and on 5 September 1945 the following findings were noted: There was a deep, well-healed, constricting, 3-inch scar posteriorly above the left elbow. Free painless movement was present at the site of the fracture. There was weakness and loss of sensation along the distribution of the ulnar nerve. The muscles of the arm, as well as those of the forearm and hand, showed considerably atrophy of disuse. Pseudarthrosis of the humerus just above the elbow joint was present. Motion at the elbow joint was absent, while motion of the wrist and hand was within normal limits. Hypo-esthesia of the sensory ulnar nerve distribution was present. There were no other abnormalities noted.

In order to successfully insert humeral bone graft it was necessary to replace the constricting scar with normal tissue. A pedicle flap was raised in stages from the left chest wall. On the third stage the cicatricial scar over the fracture site was completely excised and the flap sutured into position to fill the defect. The donor area was closed primarily. After 18 days the flap was detached, the stump ends of the flap of the recipient and donor areas were revised and sutured into position. All wounds healed without incident. On 1 January 1946 a bone grafting operation was performed.

On discharge from the hospital on 6 September 1946, the bone graft was firm and healed. Although there was no elbow motion, the patient had good hand, wrist, and shoulder motion.

Case 2.—W. L. J. was admitted on 30 April 1946 presenting the following defects: Nonunion of the ulna and radius with deep adhering scars of the left forearm overlying the site of the nonunion. There were flexor contractures of the fourth and fifth fingers and marked limitation of motion of the wrist, elbow, and hand. The extensor tendons were limited in their excursions by the constricting scar.

This patient required release of scar tissue and replacement of the defect by an abdominal pedicle flap. Bone grafting through such an area could only result in loss of tissue over the operative site. An abdominal flap was raised and transferred in two stages to replace the excised scar tissue of the forearm. The donor area was closed by means of a split thickness skin graft. The wounds healed primarily and the flap was detached after 18 days. The donor and recipient ends of the flap stumps were revised and sutured into position.

Four months later the left ulna was repaired by an onlay bone graft and fusion of the left radius was performed. Fixation was secured by means of a Roger Anderson splint.

On discharge on 11 February 1947 the graft was solid, elbow flexion 90°, extension 160°, wrist extension 180°, flexion 45°, pronation 10°, and supination 0°. Flexion of the fingers was weak but 50 percent of full grip was present.

Case 3 is an example of the use of a contiguous flap on the lower leg.

Case 3.—K. R. was admitted on 5 August 1946 with nonunion of the tibia and fibula of the lower third of the left leg. The fracture site was covered with an area of thin cicatricial skin measuring 2 by 2 inches. The surrounding skin showed considerable brown pigmentation but otherwise appeared normal. The soft tissue medial to the wound was soft and pliable.

A contiguous pedicle flap was outlined medial to the scar, elevated, and delayed in two stages. On the third stage the cicatricial tissue over the fracture site was excised, the flap elevated and transposed to cover the defect. The flap was sutured into position and the donor area covered with a split thickness skin graft. The flap healed without difficulty and 3 months later bone grafting was performed (10 February 1946). The soft tissue covering this area was found to be adequate and at the present time the bone graft is holding well and is in the process of healing.

Case 4.—A. M. A. was admitted on 14 August 1947 with an exposed bone graft of the right tibia. The graft was nonviable and nonunion of the tibia and fibula was present.

The graft was removed and the wound edges closed primarily. After complete healing of the area, procedures were started for preparing the soft tissues for a second bone grafting. An 8-inch scar was present over the lower and middle third of the anterior surface of the leg.

A pedicle flap 7 inches in length medial to the scar defect was raised in stages. The scar was excised and the flap transferred laterally to cover the defect. The donor area was covered with a split thickness skin graft. The flap healed well but was insufficient to cover the entire scar area. Accordingly a pedicle flap on the inner surface of the left thigh was raised in stages. The scar tissue in the lower border of the flap and leg measuring 3½ by 3 inches was excised and the flap was transferred cross-leg to cover the defect. The graft was detached in 18 days and healed well.

The scar defect over the site of nonunion is now covered with a viable flap and will be ready for operative procedures in 3 months. The surface covering in this patient should have been replaced prior to the first bone graft.

Case 5.—G. E. S., a 22-year-old male sustained a compound fracture on 14 September 1945. Emergency treatment was given in the field. Definitive surgery consisting of the application of a 4-hole metal plate with screws was instituted a week later. On 4 March 1946 nonunion was observed; the plate

was removed and a 5-inch sliding bone graft was cut and placed uniting the tibial fragments. Two weeks later (20 March 1946) the cast was changed revealing extensive dehiscence of the incision with 2 inches of the bone graft exposed. On 18 September 1946 following sequestrectomy, removal of graft, and frequent dressings the wound finally closed by granulation.

On 8 October 1946 a 6-inch linear scar was present over the area of the persisting nonunion. A pedicle flap was raised on the opposite thigh. The scar covering the area of the nonunion was resected and the pedicle flap transferred cross-leg to cover the defects. At the present time the area of nonunion is covered by a heavy soft, viable flap. This will furnish an adequate covering for the contemplated second graft.

Case 6.—K. D. was injured in an automobile accident on 6 July 1945. He had a simple fracture of the left femur and compound fractures of the lower third of the left tibia and fibula. Treatment consisted of a traction hip spica and full leg cast. In December 1945 a granulating wound over the site of the fractured lower leg was cured by means of a split thickness skin graft. However, a draining sinus over the fracture site persisted. He was readmitted on 18 June 1946. Examination revealed that the fracture of the fibula was healed but there was nonunion of the tibia and a small ulcer of the skin over the fracture site. On 25 October 1946 the ulceration had healed and a sliding bone graft was done with no fixation. On 18 November 1946 a window was cut in the cast and stitches removed over an area of necrosis. A portion of the bone graft 1 by $\frac{1}{2}$ inch was exposed. On 6 December 1946 plastic repair of this area was done. This consisted of débridement of the wound edges, application of furacin dressings, and later, adhesive tape dressings to pull the wound edges together. The wound improved daily and the margins of the wound became viable. On 27 February 1947 a small contiguous flap was raised in two stages medial to the wound. The scar tissue was excised from the wound edges and the flap transferred to cover the defect. The donor area was covered with a split thickness skin graft. Healing occurred without incident.

Case 7.—H. C., a young Negro male fell 40 feet into a hatch while loading supplies on a merchant ship on 8 July 1944. He suffered a complete fracture dislocation of the right ankle and a compound fracture of the left tibia and fibula at the junction of the middle third.

Débridement of the tibia fracture was done, and the fracture fragments were reduced and fixed with a plate and screws. The fracture dislocation of the right ankle was reduced and Kirschner wire passed through the os calcis for traction. On 15 July 1944 the wound over the left tibia showed considerable drainage. The right foot was in good position. On 8 October 1944 the metal bone plate and screws were removed from the left tibia; union was not secure. On 6 November 1944 examination showed poor position of the right ankle but healing of the fractures. The tibial fragments of the left leg were infected and showed no healing. On 29 December 1944 roentgenogram of the left leg showed nonunion of the middle third of the shaft of the tibia. The fracture of the fibula was solidly healed. The right ankle was also healed but in poor functional position.

The wound over the left tibia continued to drain but healing finally was observed on 24 July 1946. On 29 October 1946 roentgenogram and clinical examination revealed that nonunion of the left tibia persisted. On 10 January 1947 a sliding bone graft to the left tibia was performed. On 14 January 1947 a window was cut in the cast and a slough measuring 2 by 2 inches over the bone graft was found.

Treatment consisted of normal saline dressings changed twice daily and penicillin, 50,000 units every 3 hours. The wound improved daily. A contiguous flap to cover the defect (and to save the bone graft) was raised in stages lateral to the wound. The wound edges were freshened and the flap transferred medially to cover the defect. A split thickness skin graft was used to cover the donor area. The dressing was removed on the fourth day and the flap found to be in good condition except for drainage at the lower end. The defect healed and full cover of the exposed bone graft was obtained. Recent roentgenograms showed the bone graft to be viable.

SUMMARY

Seven cases illustrating the need for careful evaluation of cicatricial defects over operative sites that require deep surgical repair have been presented.

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The Pathology of Acute Alcoholism

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FATAL, uncomplicated, acute ethyl alcohol poisoning is uncommon. Only 3 cases were found in a series of well over 1,000 unselected necropsies at the U. S. Naval Hospital, Bethesda, Md. Perhaps it is fortunate that man has chosen ethyl alcohol to temporarily escape from his troubles. It is not easy to consume a fatal dose unless it is ingested in a comparatively large quantity within a short period of time. In the usual bout of heavy drinking the participant loses consciousness, and thereby the ability to consume more alcohol before a lethal dose is taken. Compare this with substances such as opiates, where a few grains make the difference between life and death; or with gaseous agents, where loss of consciousness results in further exposure to the toxic vapor.

Nevertheless, acute alcoholism with its resultant physical, mental, emotional, and moral deterioration is the underlying factor in a large percentage of all medical and surgical deaths: The drunken pedestrian stumbles in front of a bus; the intoxicated driver falls asleep at the wheel; the emotionally disturbed drinker takes his, or another's life; the circulation in a stenosed coronary artery falters under the strain of acute alcoholism; or the pneumococcus finds an easy victim.

Concerned with a complication of an episode of acute alcoholism, the medical officer may fail to elicit the history of the latter and the relatives are reluctant to volunteer that information. An alcoholic breath is easily overlooked and other diagnostic signs may be masked by the secondary process.

The pathologist, too, often fails to consider the possibility of acute alcoholism. The absence of pathognomonic gross or microscopic changes in simple acute alcoholism is unfortunate. The final diagnosis is made by the toxicologist rather than by the pathologist (1).

A post-mortem blood alcohol determination should be performed in all cases coming to autopsy in which death occurred within 24 hours after admission, as well as those received dead.

It is the purpose of this article to discuss the pathology of acute ethyl alcohol poisoning and its common complications.

FATALITIES

Death may follow uncomplicated acute alcoholic intoxication, or in such complications of acute alcoholic intoxication as: (a) Aspirated

foreign body and aspiration pneumonia; (b) accidental trauma; (c) homicide and suicide; (d) combinations with other poisons; (e) infections; and (f) aggravation of preexisting disease.

Alcohol is absorbed partially by the stomach, but mainly by the small intestine (2). The rate of absorption is dependent, to some extent, upon the functional status of the alimentary tract, but especially upon the presence or absence of other substances in the stomach. Individual foods differ in their capacity to delay alcoholic absorption. The experienced drinker learns early that cream is the most effective substance in this capacity.

After reaching the systemic circulation the alcohol is distributed fairly uniformly to the various body tissues, with a few exceptions. The percentage in fat is always lower, according to one authority (3) while another (4) finds it higher. Being a lipoid solvent, alcohol has a predilection for fatty tissues but the vascular supply of that tissue is also a factor. The brain may or may not reveal a level higher than the general body tissues.

Less than 10 percent of the ingested alcohol is excreted in urine and expired air. The rest is oxidized in the body, forming carbon dioxide and water; with, perhaps, some acetic acid as an intermediate product (5). This oxidation takes place largely in the liver (2). Alcohol reaches its maximum concentration in blood in from 30 minutes to 3 hours. (3) (6). After death, the alcoholic content of blood and other body tissues remains fairly constant until decomposition sets in. Putrefaction results in the production of reducing substances which give positive results in most of the present-day tests for determining blood or tissue alcohol (7). Therefore, the test should not be omitted merely because the autopsy has been delayed for a few hours. On the other hand, a high blood or tissue alcohol level in a body which has been dead for many hours, or in which there is evidence of putrefactive changes, must be interpreted with extreme caution.

One pint of absolute alcohol, or 1 to 2 pints of brandy or whiskey may be fatal if the dose is taken in a relatively short time. When the blood or tissues reveal of level of 0.5 percent alcohol or above, death may properly be attributed to acute alcoholism (7). This does not mean that a lower level is incompatible with that diagnosis. Some hypersusceptible individuals may die with much lower levels. In the typical case death does not occur until 5 to 10 hours after the onset of alcoholic coma (8). As the blood level is decreasing at the rate of 0.02 to 0.04 percent per hour (3) or, expressed in another way at the rate of 10 cc. of alcohol per hour (2); the level at the time of death does not represent the peak reached. There is some evidence that the blood and tissue concentration reaches its maximum quicker and decreases faster in chronic alcoholics due to their ability to oxidize

alcohol more rapidly (6). This may be lost in later years and with it their increased tolerance.

During life, spinal fluid determinations are more reliable than blood, urine, or expired air. Gettler and Freireich (9) have shown the close relationship between the alcoholic content of spinal fluid and the brain.

After death, it is recommended that the brain, blood, and urine be analyzed. Gastric content is the least desirable as there may be a high gastric concentration without intoxication, if death occurred before any appreciable absorption occurred. Moritz and Jetter (10) point out the value of comparing the urine level with that of the blood. They showed that if the post-mortem blood level is considerably higher than the urine level, it may be assumed that death took place fairly soon after the alcoholic ingestion. If the urine alcohol level is disproportionally high it indicates that the blood level had been higher and that death occurred some hours after the drinking.

These interpretations may be made only if the autopsy is performed soon after death for when life ceases there is a gradual diffusion of alcohol from the blood stream into the bladder, or conversely, until equilibrium takes place.

PATHOLOGIC FINDINGS IN UNCOMPLICATED ACUTE ALCOHOLISM

As previously mentioned, there are no pathognomonic signs, either gross or microscopic, of acute alcoholism. This should not discourage the prosector or microscopist from seeking and recognizing changes which are consistent with, even though not diagnostic of, acute alcoholism.

Edema and hyperemia of the esophagus has been described (4). As alcohol is in its highest concentration when contacting gastric mucosa, it is not surprising that acute gastritis is often present (11). This may consist of hyperemia, petechial hemorrhages, and superficial erosions of the mucosa; especially near the pylorus. There may or may not be an odor of alcohol. In the case of wine there may be characteristic staining of the mucosa (1).

Due to its large lipid content, the brain is extremely susceptible to lipophilic agents such as alcohol (12). The most important changes are, therefore, to be looked for in the central nervous system, but unfortunately, they may be insignificant or lacking with our present-day methods of examination and tissue preparation. Peters (13) compares this with the findings, or rather the lack of findings, in diabetic coma, another condition which produces dramatic clinical but minimal pathologic findings. Anyone observing a drinking bout can readily follow the sequence of central nervous system involvement. The higher cerebral centers are the first disturbed. Later, ataxia and loss of sphincter control indicates cerebellar and spinal cord

involvement. In the rare fatal cases the medulla is involved with paralysis of the respiratory center (3) (8). The drug produces dilatation of the vascular channels with stasis, escape of serum, and possibly hemorrhage by diapedesis (14). Although some authors report an increase in the quantity of fluid in the subarachnoid spaces (11), this so-called "subarachnoid hydrops" is more characteristic of chronic alcoholism and other conditions producing cerebral atrophy. The vessels of the meninges and brain are usually markedly congested (3) (11) (14). Varying degrees of edema of the brain and meninges may be noted (11) (15). There is no pathognomonic sign of cerebral edema but it is suggested by a heavy organ with flattened convolutions, narrowed sulci, and a "sticky" sensation on cutting. There may be a corresponding decrease in the amount of subarachnoid fluid within the cranial cavity. In extreme cases cerebellar pressure cones may be present. Microscopically, the parenchyma presents a spongy appearance with the formation of clear spaces, especially about the blood vessels. Petechiae in the white matter have been noted.

Considering the fact that the liver is dependent upon factors in which lipoids are of great significance (12) and that most of the alcohol oxidation takes place in that organ, it is logical to assume that this organ would also be affected considerably. There have been some ante-mortem studies to determine the presence or absence of hepatic damage during acute alcoholism but the results are not conclusive. Wallace (16) found elevated serum bilirubin and increased urine urobilinogen in intoxicated humans, but Lamson (17) gave dogs large doses of alcohol and found normal phenoltetrachlorophthalein liver function tests.

The kidneys show only minimal and readily reversible toxic changes consisting of congestion, edema, and minimal tubular degeneration. A severe toxic nephrosis should arouse suspicion of a toxic agent other than ethyl alcohol. The urinary bladder is frequently full due to the quantity of fluid taken in conjunction with the alcohol or due to the diuretic effect of substances in certain liquors, such as the essential oils in gin (15). Alcohol per se is not a diuretic.

Other visceral changes are attributable less to the direct action of the alcohol than to the anoxemia secondary to depression of the respiratory center. The typical findings in anoxemia are often seen: The blood is dark and shows little tendency to clot; the heart is dilated and flabby; there are petechial hemorrhages into the pleura, pericardium, and endocardium; pulmonary edema may be prominent (30); and dark congestion of all viscera is seen (3) (8) (11).

The lungs may exhibit congestion, edema, focal hemorrhages, and early pneumonia (usually aspirational) (3) (11). The trachea may contain frothy, pink fluid mixed with alcoholic beverages or regurgitated gastric contents (11).

White (18) states that alcohol "in strong concentrations" may injure the myocardium and he has observed neurocirculatory asthenia and paroxysmal arrhythmia following acute alcoholism. Pathologic changes in the heart, however, are insignificant.

Miscellaneous changes have also been noted: Rigor mortis sets in early and is of long duration (1) (15) (this is common to most violent and poisoning deaths); the skin may be unusually pale (15); or there may be marked post-mortem lividity (1) (15).

In association with the above changes there are two additional groups of findings: (a) those of *chronic* alcoholism, such as fatty liver, cirrhosis, avitaminosis, cerebral atrophy, etc.; and (b) those secondary to, or complicated by, the acute intoxication.

Aspiration of a bolus of food or other foreign body by the intoxicated individual is not uncommon and is frequently fatal (19). It is not surprising that the vomiting of an acute alcoholic frequently results in aspiration of gastric contents with subsequent pneumonic consolidation.

Alcoholism plays an important role in almost 50 percent of deaths due to accidental trauma, homicides, and suicides (8). According to Berry (20), alcohol contributes to at least one in every five fatal automobile accidents; and 30 percent of pedestrians involved in fatal accidents are under the influence of alcohol. Norris (21) found that 22 percent of pedestrians, over 16 years of age, struck by automobiles were drunk when killed, and 40 percent of persons shot or stabbed died intoxicated.

Alcohol predisposes to fatal poisoning by other drugs taken in sublethal doses. Sublethal doses of barbiturate may prove fatal when combined with acute alcoholism (22). The alcoholic, seeking any spirits-containing substance, may ingest almost any toxic substance. Since the use of synthesized methyl alcohol, which lacks the characteristic odor of distilled "wood alcohol," the danger of methanol poisoning among chronic alcoholics has increased. Bogen (4) clearly summarized the various substances frequently found in association with pure ethyl alcohol in the more commonly used beverages. Acetaldehyde is found in "moonshine" (unaged, poorly distilled, or fermented whiskeys) but is usually in insufficient quantities to cause ill effects (23). The hypnotic effect of beer is caused by the lupulin from the hops; the diuretic effect of gin by the essential oils; the convulsions in absinthe or vermouth by oil of wormwood; and the flaccid motor paralysis in Jamaica ginger or "Jake" by triorthocresol. Denaturing agents which include such agents as carbolic acid, formaldehyde, bichloride of mercury, and camphor are usually present in too small a quantity to cause poisoning and it is the ethyl alcohol in denatured alcohol which produces the fatalities.

Alcohol and carbon disulfide exert a synergistic action (24). Konwaler and Noyes (25) have pointed out the increased susceptibility of alcoholics to carbon tetrachloride poisoning. In a convincing report, these authors compare the serious effects on three men exposed to carbon tetrachloride fumes (including one fatality) to three others who were practically unaffected by the same exposure. The former men had been on an alcoholic spree the previous week end.

The hapless inebriate is not only exposed to an increased number of infections but in certain instances lacks the usual resistance to overcome these infections. Pneumonia presents an extreme hazard for several reasons: (a) The inebriate spends the night on a park bench or falls asleep in a cold automobile; (b) he runs the risk of aspirating the vomitus which is almost invariably present during the course of intoxication; and (c) there is general dilatation of capillaries with increased radiation of body heat and resultant chilling (26). Finally, it has been observed clinically (27) and substantiated experimentally (28) that acute alcoholism results in a decreased resistance to the pneumonococcus.

The importance of alcohol in aggravating preexisting disease is all too frequently overlooked. The precipitation of an episode of coronary occlusion or the aggravation of the symptoms of coronary occlusive disease during alcoholic excesses is not uncommon (8) (18).

Alcohol is a very important factor in acute pancreatitis (29) (30). In reviewing 51 fatal cases of acute alcoholism, Branch (29) found acute pancreatic lesions in almost 50 percent. Clark (30) states that all his cases of massive pancreatic necrosis followed an acute alcoholic debauch.

Seizures may be precipitated in latent epileptics or increased in number and severity in known cases (31). Persons with acute hepatitis are properly warned to abstain completely from alcoholic beverages. A mild case of hepatitis may become severe, a severe one fatal, and a subsiding one, fulminant, by the action of alcohol. Its role in pellagra, tuberculosis, cirrhosis, and innumerable other illnesses is more related to chronic intoxications and will not be discussed.

CASE REPORTS

Case 1.—A middle-aged man, placed in bed following a bout of heavy drinking, was found dead the next morning. He was known to have been a heavy drinker. At autopsy the following positive findings were noted: Weight, 180 pounds; length, 70 inches; lips, mucous membranes, and nail beds, cyanotic; the blood showed no tendency to clot.

Brain: 1,470 gm. Congestion of meningeal and cerebral vessels. Microscopic: congestion with small perivascular hemorrhages. Petechial hemorrhages of pleura and pericardium.

Heart: 380 gm. Flabby. Moderate coronary atherosclerosis.

Lungs: 500 and 690 gm. Severe pulmonary edema.

Pancreas: Moderate necrosis with a few acute inflammatory cells, congestion.

Liver: 2,270 gm. Moderate fatty change.

Stomach: Marked congestion and petechial hemorrhages of the mucosa. Remaining organs not remarkable. Post mortem blood alcohol 0.45 percent.

Diagnosis.—Acute alcoholism with terminal pulmonary edema.

This illustrates the more unusual type of death in which alcohol alone produces the fatality. The only other factor present which may have been of importance was the coronary atherosclerosis. This was only moderate with little narrowing of the lumen and no evidence of myocardial anoxia. The fatty liver is in keeping with the history of chronic alcoholism.

Case 2.—A middle-aged man was found dead in bed. An empty bottle of amytal was found next to the bed. He was known to have been emotionally depressed for some time. At autopsy the following findings were present: Weight: 160 pounds; length 66 inches.

Brain: Marked congestion. No weight or microscopic examination recorded.

Heart: Slight atherosclerosis.

Lungs: 790 and 795 gm. Severe congestion and edema. Old fibrous adhesions. Healed primary complex of tuberculosis. Microscopic: Numerous ruptured capillaries with hemorrhages.

Liver: Moderate fatty change.

Spleen: Marked congestion.

Pancreas: Post-mortem necrosis. Remaining organs not remarkable. Post-mortem blood alcohol was 0.1 percent. The gastric contents disclosed 12 grains of amytal.

Diagnosis.—Acute barbiturate poisoning.

It is very likely that the alcohol was consumed in this case to muster "courage" to carry through with the contemplated suicide or possibly the idea may not have been entertained until after the consumption of the alcohol. The alcohol level does not appear to have been sufficient to have contributed directly to the death.

Case 3.—This 56-year-old man was retired because of essential hypertension. He was found dead at 0130 by his wife. He had been drinking throughout the entire evening. At autopsy the following findings were recorded: Weight, 240 pounds; length, 68 inches; cyanosis of lips, mucous membranes, and nail beds; the blood showed no tendency to clot.

Brain: 1,340 gm. Marked congestion of the vessels of the meninges and brain. Moderate atherosclerosis of the basilar arteries. Increased subarachnoid fluid. Slight atrophy of the frontal lobes. Microscopic: Congestion. Moderate degenerative changes of the nerve cells with some disarrangement of the cortical layers. Perivascular edema. Focal areas of fibrous thickening of the arachnoid. Petechial hemorrhages of pericardium.

Heart: 865 gm. Flabby. Chronic adhesive pericarditis, myocardial hypertrophy and fibrosis. Syphilitic aortitis. Minimal atherosclerosis of coronary arteries and aorta.

Lungs: 755 and 800 gm. Chronic obliterative pleurisy. Severe pulmonary edema.

Liver: 1,850 gm. Fatty change.

Spleen: 280 gm. Marked acute and chronic passive congestion.

Pancreas: 16g gm. Soft with hemorrhagic areas. Microscopic: Acute hemorrhagic necrosis.

Stomach: Marked congestion of the mucosa. Acute and chronic passive congestion of the abdominal viscera consistent with long standing cardiac insufficiency. Post-mortem blood and urine 0.5 percent alcohol. Spinal fluid 0.35 percent alcohol.

Diagnosis.—Acute alcoholism.

Although the blood alcohol level permits the diagnosis of acute alcoholism in this case, the severe cardiac disease undoubtedly was an important contributing factor or vice versa. The cerebral atrophy could have been caused by chronic alcoholism, cerebral atherosclerosis, or syphilis of the central nervous system. The microscopic changes were suggestive of the latter.

CONCLUSIONS

1. Uncomplicated fatal acute alcoholic intoxication is uncommon.
2. There are no pathognomonic findings in acute alcoholism.
3. The most constant pathologic changes are severe meningeal and cerebral congestion, pulmonary edema, acute gastritis, visceral congestion, and acute pancreatic necrosis. Most of these changes are found in other conditions especially those characterized by anoxemia.
4. Post-mortem blood, urine, and tissue alcohol determinations are of diagnostic value only when death has taken place within a few hours after the onset of the alcoholic coma, providing the autopsy is performed before putrefaction has begun.
5. Acute alcoholism should be suspected in all cases of suicide, homicide, accidental trauma, poisoning, and as a complicating or precipitating factor in other medical or surgical fatalities.

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A Method for Serum Albumin Determination

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THE standard micro-Kjeldahl method for serum albumin determination was found to be too time-consuming to accomplish the large number of such tests required in the laboratory at the U. S. Naval Hospital, Long Beach, Calif. Therefore, the authors devised the method described in this article which has proved satisfactory in all respects.

A review of the literature revealed a number of other methods for serum albumin determination, each of which were carefully evaluated. However, we found in them no particular advantage over the method described here. The biuret method described by Kingsley (6) offers some advantage over the micro-Kjeldahl procedure, this method requires more reagents and more time for the performance of the test than our method. In the method described by Greenberg (3), Folin's phenol reagent is used. The preparation of this reagent required approximately 11 hours, and we have found that the reagent frequently has a greenish tinge and therefore must be rejected. The performance of the turbidometric method for globulin determination as described by Looney and Walsh (8) appears to be easier than the method described except that the preparation of the globulin standard is a complicated procedure requiring dialysis of serum and standardization of the resulting globulin. If prepared globulin could be purchased, this method would be ideal for ease of performance. The simplest method noted in the review of the literature is the centrifuge method described by Lewis (7). This method requires special centrifuge tubes. We have tried this method using ordinary test tubes but the inaccurate results were discouraging. Admittedly, our trial of the test was a crude one, but our results made it difficult for us to justify the purchase of the special equipment required.

The method to be described is essentially a combination of the principles described by Kingsley (5) for the separation of albumin, and by

Denis and Ayer (2) for the cerebrospinal fluid protein determination, plus the use of human serum albumin as a standard.

Principle.—The globulin is removed from serum by precipitation with half-saturated sodium sulfate. The remaining albumin is precipitated with sulfosalicylic acid and the degree of turbidity is determined by use of the photoelectric colorimeter.

Solutions:

1. 23 percent sodium sulfate, reagent grade.
2. 0.85 percent sodium chloride, C. P.
3. 3 percent sulfosalicylic acid, reagent grade.
4. Anesthetic ether.

Procedure:¹

1. Place 7.5 cc. of 23 percent sodium sulfate in a 15 to 20 cc. capacity tube.
(The sodium sulfate must be kept at a temperature of 37 to 38° C.)
2. Add 0.5 cc. of serum. Mix by inverting tube.
3. Add approximately 3 cc. ether and shake vigorously for 20 to 30 seconds.
Cap tube to avoid loss of ether.
4. Centrifuge from 5 to 10 minutes at approximately 2,200 r. p. m.
5. Slant tube so that the tightly packed globulin floating on the sodium sulfate solution separates from the walls of the tube. Withdraw 1 cc. of the sodium sulfate mixture.
6. Add 4 cc. of 0.85 percent sodium chloride. Mix well.
7. Take 1 cc. of the above mixture.
8. Add 5 cc. of 3 percent sulfosalicylic acid.
9. Invert 6 times.
10. Mix and allow to stand 10 minutes. Read in photoelectric colorimeter after inverting twice.

Calculation.—(Reading \times Factor) \times 0.08 equals grams percent of albumin. The factor represents the amount of albumin in each unit of the colorimeter scale and is determined by dividing the mg. percent of albumin in the working standard by the reading of the photoelectric colorimeter.

Example: Factor=45.2/reading of standard.

In this case 45.2 is the amount of albumin contained in the standard in mg. percent.

The figure 0.08 corrects for dilution and converts from mg. percent to grams percent.

Preparation of standard.—The entire contents of one standard Army and Navy package of human serum albumin which contains 25 gm. albumin is diluted to 500 cc. by adding 0.85 percent sodium chloride (a few drops of caprylic alcohol will prevent foaming). This constitutes the stock standard which contains approximately 5 gm. percent of albumin. Determine the exact amount of albumin in the

¹ The first five steps of the procedure are copied verbatim, except for the change in the amount of sodium sulfate mixture withdrawn in step 5, from the Naval Medical School Blood Chemistry Manual, p. 45, reference, Kingsley.

stock standard by the micro-Kjeldahl technique. For preparation of the working standard, dilute 1 cc. of the stock standard to 100 cc. The strength of the working standard is equal to the strength of the stock standard as determined by the micro-Kjeldahl technique divided by 100. It is not necessary to vary the amount of stock standard used, as the resulting albumin content of the working standard will closely approximate the desired strength of 50 mg. percent.

The first 68 tests performed by the sulfosalicylic acid method were checked by the modified micro-Kjeldahl test as described by Kingsley (5). The differences in the results of the examinations by the two methods are presented in figure 1.

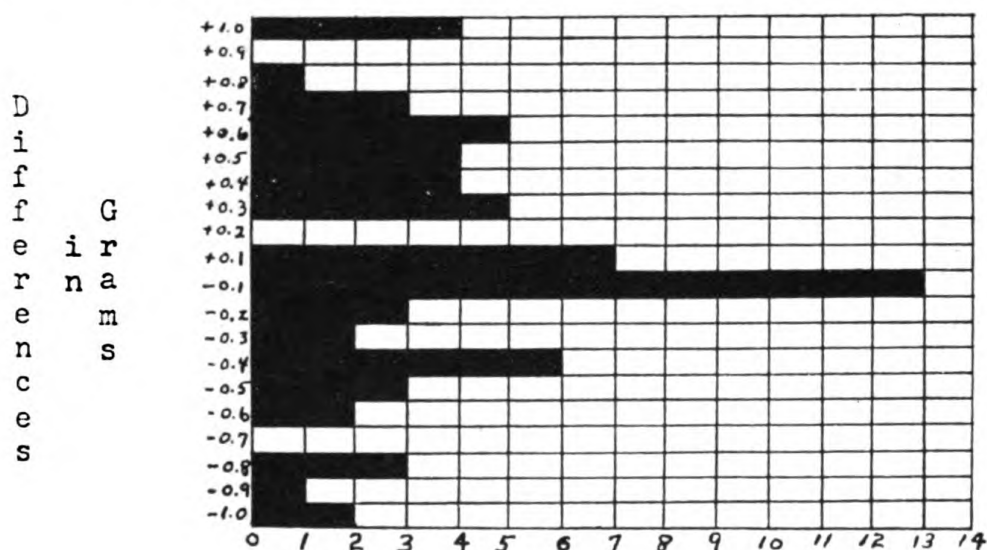


Figure 1.—Number of tests.

The differences in the results of each test are represented on the vertical scale as positive and negative numbers. The positive numbers mean that the result obtained by the sulfosalicylic acid method was greater than the result obtained by the modified micro-Kjeldahl procedure to the extent represented by the numbers in grams. The negative numbers mean that the result obtained by the sulfosalicylic acid method was less than the result obtained by the micro-Kjeldahl method to the extent indicated. The horizontal scale represents the number of tests in which the differences of results were within the range represented by the vertical scale. In viewing the chart it may be noted that approximately one-third of the tests agreed within one-tenth of one gram; then there is a gradual decrease in numbers of tests which showed a greater difference in results. It also may be noted that the positive and negative differences roughly cancel each other, there are 33 black squares on the plus side and 35 black squares on the minus side.

The question arises as to which test is more accurate. The micro-Kjeldahl test requires more reagents, more dilution of the original specimen, more technical procedure, and more steps in the determination. Each of these factors introduce additional sources of error. However, the colorimetric determination of the ammonium radical is probably more exact than the turbidometric determination of the precipitated albumin. The micro-Kjeldahl test is considered to be more accurate if done with extreme care and precision. In the performance of a large number of tests the over-all accuracy of the determinations as described in this article should be greater because of the simplicity of the test and greatly reduced sources of error.

SUMMARY

A method for serum albumin determination is presented. The method consists of the removal of globulin from serum by precipitation followed by nephelometric determination of the albumin remaining in solution using sulfosalicylic acid as the precipitant and human serum albumin as the standard.

CONCLUSIONS

The authors believe that the method described in this article for serum albumin determination is simple, workable, satisfactory for routine clinical use, and offers advantages over other methods.

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Field Trial of "Shigella Flexneri III" Vaccine

Background, Scope, and Organization of the Program

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SHIPBOARD outbreaks of shigellosis (bacillary dysentery) have long been of great concern to the Medical Department of the Navy. There was an outbreak of diarrhea in the Battle Fleet in Guantanamo Bay during April 1927 (1) that assumed serious proportions and another epidemic among ships concentrated in the same area during March and April 1930 (2) which resulted in a total of 939 reported cases. In each instance, the causative organisms were found to be Flexner bacilli, but the specific serologic types involved are not known. In these two episodes there were an undetermined number of mild, ambulatory patients who were not admitted to the sick list. During 1943 and 1944 outbreaks of shigellosis occurred in various ships operating in the Pacific area (3). In the summer of 1945 the problem reached major proportions when an epidemic of bacillary dysentery swept through the ships of the U. S. Navy anchored in San Pedro Bay at the head of Leyte Gulf, Philippine Islands (4). Approximately 150 ships, and well over 6,000 personnel were involved. The responsible organism was identified as *Shigella flexneri* III. Different strains were found to possess varying amounts of *S. flexneri* type VIII antigen. The apparent source of the infection was the native population on shore. Bacillary dysentery had been endemic among the natives; organisms of the same type were isolated from a group of natives recovering from the disease. The probable channels of spread were from contaminated feces to food via flies to liberty parties from the ships in the harbor (4). The *S. flexneri* III organism, apparently thus introduced into the Pacific Fleet at Leyte Gulf, was responsible for a widespread outbreak among ships anchored in Tokyo Bay during the latter part of 1945 and the early part of 1946 and among ships enroute to Bikini in May 1946 (5).

It has been the etiologic agent in all the major epidemics of shigellosis in the Pacific Fleet subsequent to the Leyte Gulf outbreak (5) (6) (7) (8). Cultural studies of organisms isolated during epidemics from 1942 to early 1945 revealed no single type of organism responsible for repeated shipboard outbreaks of shigellosis (3).

Epidemiologic aspects.—The essential factors involved in outbreaks of shigellosis aboard ship are reviewed briefly under the six headings shown below.

(a) *The carrier.*—Following an epidemic of bacillary dysentery, from 1 to 80 percent of persons involved become asymptomatic carriers of the organism (9). Fletcher and MacKinnon (10) studied 935 dysentery convalescents and reported that the incidence of carriers 3 months after illness was 2.78 percent. The studies of Watt, Hardy, and De Capito (11) (12) have shown that in endemic areas carrier rates of 6 to 10 percent are not uncommon. Mass surveys in New Mexico, Georgia, and Puerto Rico revealed a carrier rate of 3.5 percent as compared with 0.1 percent in New York City. During a cultural survey of 1,240 presumably healthy recruits at a Naval Training Center in 1944, Cheever (13) found a *Shigella* carrier incidence of 2.1 percent; none of the types isolated, however, was *S. flexneri* III. The recurrent epidemics of shigellosis in the Pacific Fleet have resulted in a seeding of carriers of *S. flexneri* III among personnel aboard various ships. Cultural surveys conducted on certain vessels almost invariably have revealed a number of asymptomatic individuals harboring the organisms (7) (8). It is well known that the asymptomatic carrier rate increases remarkably during an epidemic.

(b) *Susceptibility.*—The entry of previously unexposed individuals into an endemic area of shigellosis is one factor responsible for the perpetuation of outbreaks. Hardy and his coworkers (14) found that the attack rate among newly admitted institutional inmates far exceeded that in patients who have been present for appreciably longer periods of time. Thale and Oppen (15) also emphasized the role played by the entry of new susceptibles in asylum outbreaks. Studies aboard a destroyer tender involved in an epidemic of dysentery due to *S. flexneri* III (VIII) disclosed an attack rate of 48 percent among 300 individuals reporting for duty after the ship had entered the endemic area, in contrast to 20 percent in the crew previously aboard (6). Analysis of three shipboard outbreaks of shigellosis has shown the attack rate in nonrated personnel (men who had been in the Navy a relatively short time) to be consistently higher than in rated men (16); table 1 summarizes these findings.

TABLE 1.—Attack rate among rated and nonrated personnel in 3 shipboard epidemics of dysentery due to *S. flexneri* III

	Strength	Cases	Attack rate
			Percent
<i>Ship A, Bikini, 1946</i>			
Nonrated men.....	265	81	30.6
Rated men.....	153	30	19.6
<i>Ship P, Bikini, 1946</i>			
Nonrated men.....	154	32	20.8
Rated men.....	85	9	10.6
<i>Ship C, Guam, 1947</i>			
Nonrated men.....	524	252	43.1
Rated men.....	296	92	31.1

(c) *The organism*.—Certain characteristics of the *S. flexneri* III strains responsible for the outbreaks in the Pacific Fleet are of importance in considering the problem. Cheever (4) demonstrated that the organisms may remain viable in sea-water for at least 48 hours and pointed out the implications of this finding in terms of contamination of harbor water by sewage discharged from ships at anchor. He mentioned numerous examples of ship-to-ship spread of the disease by harbor water so polluted. The organism is markedly resistant to sulfonamides. Strains from the Leyte Gulf and subsequent outbreaks (3) (4) (8) (17) have grown luxuriantly in high concentrations of sulfadiazine, some of them even in 750 mg./100 ml. (18). Attempts at large scale prophylaxis with sulfonamides, in the hope of reducing case and carrier incidence, have been of no avail. In vitro sensitivity to streptomycin has been established (3) (19) and a small group of carriers was apparently effectively treated with this antibiotic (8).

(d) *Shipboard life*.—The "closed population" aboard ship results in such closeness of contact that rapid spread of the disease takes place once the process is started. In his report of the Leyte Gulf epidemic, Cheever placed this factor of personal contact second in importance only to contamination of sea water. The ever present possibility that some defect in drainage or plumbing may result in the pollution of fresh water lines with sea water was emphasized by Mount and Floyd (7) who studied an epidemic aboard a cruiser in which a defective dishwashing machine was implicated as the original means of spread aboard ship.

The presence of the organism in foodhandlers has not yet been established as a major factor in a shipboard outbreak, although the control of such groups both as to sanitary practices and by frequent cultural surveys is always emphasized as a preventive measure. There can be little doubt that, if overlooked, this could be a serious hazard.

(e) *Other factors*.—Flies, although known to be capable of spreading bacillary dysentery, have not been incriminated as a prominent factor in shipboard outbreaks. There was no apparent effect on

the course of the Leyte Gulf epidemic when extra chlorination of drinking water was instituted. The production of drinking water by shipboard evaporator installations was investigated extensively by Barnes and his coworkers (20) who found such water safe and potable.

(f) *Control of outbreaks.*—An idealistic program of control in the problem of recurrent shipboard epidemics described would be one aimed at the detection and effective treatment of all carriers of *S. flexneri III*. Isolation of the carrier would eliminate the continuing reservoir of infection and the disease should die out. The difficulty and impracticability of such a program lie in the detection of carriers and their removal from duty for protracted periods of time. Fletcher and MacKinnon (10), in their studies of dysentery convalescents in World War I, noted that Flexner carriers tended to shed the organisms intermittently, periods as long as a month sometimes intervening between positive cultures. These carriers were asymptomatic and had no recurrence of symptoms as stool cultures again became positive. Shiga carriers, in contrast, failed to show this intermittency and tended to be chronically ill. Philbrook and his coworkers (8) cultured a group of 60 cases and carriers of *S. flexneri III* from a cruiser in the Pacific an average of 5 times weekly for several months and found that the organisms were shed intermittently. These investigators calculated from their data that 30 consecutive daily cultures were necessary to insure that 95 percent of these carriers were free of the organism, 20 cultures for 80 percent, and 10 cultures for 50 percent. It is evident that the usual criterion of 3 consecutive negative cultures is inadequate and that a mass survey of the Pacific Fleet complete enough to detect even 50 percent of such carriers is impossible.

Parenteral dysentery vaccines.—The efficacy of parenteral vaccination as a preventive measure against bacillary dysentery has been a subject of controversy since Shiga first recommended the use of a sero-vaccine in 1903 (21). The toxicity of *Shigella* vaccines, especially those of the Shiga bacillus, has been a limiting factor in the use of such preparations. The present discussion will be confined to bacterial vaccines for the Flexner group of organisms.

Certain points have been demonstrated repeatedly in the use of vaccines for shigellosis and can be regarded as well established: (a) *Serum antibody production.*—Parenteral vaccination of animals with vaccines of *S. flexneri* strains result in the production of high levels of serum antibody as measured by the agglutination test (22) (23) (24) (25) or the mouse protection test (24) (25). In human subjects also, well tolerated doses of bacterial vaccines or modified antigenic materials are capable of stimulating the production of agglutinins (26) (27) (28) and mouse protective antibodies (28) (29) (30).

Using pooled serums from children who had received large doses of a monovalent vaccine, Cooper and his colleagues (28) were able to demonstrate increases as high as 54-fold in serum mouse protective titer. (b) *Protection in actively immunized animals*.—Mice actively immunized with *Shigella* vaccines are protected against challenge doses of the homologous organism (31) (32). Forsyth (33) gave a monovalent vaccine to rhesus monkeys; when challenged orally with large amounts of the homologous organism, 20 vaccinated animals remained asymptomatic while 6 of an equal number of controls developed clinical dysentery.

Evidence that vaccination is effective in protecting humans from shigellosis is inconclusive. During the past half century, many reports both favorable and unfavorable have appeared. Paddle (34) used a polyvalent vaccine, with a total dose of 500 million organisms, in an attempt to control asylum dysentery at Caterham Hospital. By inoculating all contacts of clinical cases, he was able to reduce the incidence of the disease in contacts to one in 99 as compared with one in 33 in years prior to the use of vaccine. Caldwell and Hardwick (35), using a similar preparation, lacked a significantly large control group but were led to recommend the use of the vaccine to protect well contacts at the time of an outbreak. An epidemic of dysentery in children appeared to be controlled effectively by the administration of a monovalent vaccine prepared from strains isolated in the outbreak; the total dose was 1.75 billion organisms (36). Use of a polyvalent vaccine in doses as large as 9 billion organisms has been reported (27). In those groups to which this vaccine was given, there were no outbreaks of dysentery during the season in which dysentery had been present previously and was currently prevalent in other asylums.

A less favorable report is that of Shaughnessy and his coworkers (37). Human volunteers inoculated with a polyvalent vaccine, containing 6 *Shigella* strains with a total dose of 12 billion organisms, were challenged with large oral doses of one of the homologous strains. There was no significant difference in the incidence of clinical dysentery in the vaccinated and control groups. Both heat-killed and irradiated vaccines were used and, while serological studies on subjects in the test were not done, the same vaccine had previously been demonstrated to stimulate the production of significant levels of mouse protective antibodies in humans. Hardy et al. (38) reported completely negative results in a program of vaccination in institutions. In well-controlled studies, followed for as long as 20 months, using both monovalent and polyvalent vaccines during at least six outbreaks this group was unable to demonstrate any beneficial effect of the vaccines either in the prevention of the disease or alteration of the severity of clinical infection.

The lack of controlled conditions in the more favorable reports on the use of dysentery vaccines makes it difficult to draw any definite conclusion. The variability of the natural history of the disease could have been a significant factor in such studies. The criticism may be made of Shaughnessy's work that there was nothing to indicate that the artificially induced infection was comparable to the naturally occurring disease insofar as the protection afforded by vaccination was concerned. The present status of the problem has been summarized by Weil (39) as follows: "Thus, definite proof of the value of active immunization can only be obtained by the exposure of an immunized population under adequately controlled conditions. Data on this crucial point have not been forthcoming in a way to eliminate reasonable doubt." The recent study of Hardy and his group (38) was conducted, however, with the control that was lacking in previous reports and the authors concluded: "* * * that present vaccines administered parenterally have no significant value in the control of clinical or subclinical *Shigella* infections."

Oral dysentery vaccines.—An extensive review of the controversial problem of oral vaccination has been presented recently by Dolman (40). The author summarized as follows: "* * * although Besredka's local immunity concept found early support outside discipular circles, modern views on immunity mechanisms point to the probability that the phenomena he observed were at least partly due to antibody globulin held mainly intracellularly, and partly to enhanced phagocytosis." Large scale field trials of oral dysentery vaccines in humans were discussed by Dolman and the results, although inconclusive, appeared favorable.

An oral vaccine prepared from strains isolated from patients was employed in a mental hospital (41) over a 10-year period. As a control group, new admissions in alternate years did not receive the vaccine. Cases of dysentery were found to occur only in the non-vaccinated inmates or those vaccinated more than 2 years previously.

The question as to whether an effective local immunity against bacillary dysentery can be achieved by the use of oral vaccine remains unanswered. The criticism advanced with regard to early studies of parenteral vaccines applies equally well to those introduced orally. No definite conclusions can be drawn until alternate case controls are used and adequate bacteriologic data are forthcoming.

The proposal.—In August 1946, in recognition of the problem previously outlined, project X-756, now NM 005 010 (42), was formulated and subsequently approved by the Bureau of Medicine and Surgery; one section of the project dealt with the development and use of *Shigella* vaccine. In November 1946, interest in the possible use of dysentery vaccines received added impetus as a result of a suggestion

by the Commander in Chief, Pacific, that "research looking toward better protection from epidemics of bacillary dysentery in the Fleet be intensified" (43). The situation was unique in that a single type of *Shigella* was involved and a survey of the available evidence appeared to justify a field trial of the efficacy of monovalent vaccines made from a representative strain of the organism in preventing future outbreaks. In September 1947, the proposal was outlined at a conference (44) at the Bureau of Medicine and Surgery and approved by this group; the plan was also favorably endorsed by the Subcommittee on Infectious Diseases of the National Research Council (45). Implementation of the program proceeded as rapidly thereafter as possible.

SCOPE AND ORGANIZATION OF THE PROGRAM

Units selected for study.—Five light cruisers of the Pacific Fleet were chosen for the study. All necessary authorization was obtained and, prior to starting the project on each ship, the Commanding Officer was interviewed and briefed on the background, objectives, and plans of the investigation. Each of the ships had experienced at least one outbreak of shigellosis subsequent to 1945. Table 2 illustrates the reported incidence of bacillary dysentery aboard each of these vessels for the three years preceding this study. At the time the program was initiated, the total strength of each cruiser was from 700 to 900 officers and men. As a general policy, personnel who were not to be aboard for longer than two months after initiation of the study were excluded from the program.

Materials employed.—Previous studies by Cooper and his co-workers (28) (31) indicated a high degree of antigenicity of the *S. flexneri* III (Be) strain used by this group. This organism had been isolated several years before from the stool of a child with dysentery in the Children's Hospital in Cincinnati, Ohio. It had apparently remained stable in mouse virulence and antigenicity (46) and was therefore chosen for use in making the *Shigella* vaccines employed in the program. Mice inoculated with this strain survived challenge doses of *S. flexneri* III strains isolated during 4 epidemics in the Pacific Fleet (46), thus suggesting that adequate cross-protection could be expected. On the basis of certain evidence (46) (47) (48), it was decided to administer *Shigella* vaccine to part of each ship's company by the oral route in addition to the parenteral introduction to a second group on each vessel. A third group was scheduled to receive placebos.

TABLE 2.—*Bacillary dysentery as reported from 5 cruisers, June 1945 through May 1948*¹

Year	Ship No. 1		Ship No. 2		Ship No. 3		Ship No. 4		Ship No. 5	
	Strength	Incidence	Strength	Incidence	Strength	Incidence	Strength	Incidence	Strength	Incidence
1945										
June.....	1,236	0	1,326	0	1,322	0	1,258	0	1,287	0
July.....	1,284	0	1,326	0	1,304	0	1,296	0	1,296	0
August.....	1,225	0	1,326	0	1,296	0	1,290	0	1,198	0
September.....	1,142	0	1,205	0	1,204	0	1,136	0	1,146	0
October.....	1,045	0	1,152	0	1,120	0	1,071	348	1,063	367
November.....	1,050	0	1,127	0	903	0	922	23	903	133
December.....	937	0	1,163	0	1,175	0	951	5	1,157	15
1946										
January.....	918	0	1,057	0	961	0	923	14	1,278	0
February.....	908	0	1,012	0	930	108	859	1	1,106	0
March.....	767	0	1,056	6	884	3	845	0	1,066	0
April.....	767	0	925	2	662	1	687	0	948	0
May.....	769	0	993	2	740	0	840	0	420	0
June.....	784	0	564	0	805	0	867	0	460	0
July.....	697	0	549	0	882	0	806	0	819	0
August.....	758	0	361	0	759	0	1,006	0	761	0
September.....	821	0	623	0	759	0	923	1	725	0
October.....	1,017	189	618	0	695	0	795	0	732	237
November.....	889	136	674	0	650	0	924	0	833	26
December.....	802	20	685	0	713	0	953	10	847	0
1947										
January.....	872	0	624	0	806	0	931	0	756	0
February.....	913	0	698	0	956	0	964	0	840	0
March.....	936	0	(²) 0	0	831	0	965	0	959	0
April.....	916	0	854	1	905	83	976	0	834	0
May.....	865	0	1,046	0	893	16	869	0	840	0
June.....	853	0	945	266	880	3	983	0	880	0
July.....	853	0	772	99	1,021	0	949	0	960	0
August.....	1,145	0	829	5	952	0	1,047	0	958	0
September.....	957	0	910	0	945	0	961	0	922	0
October.....	778	0	895	(²) 1	976	0	789	0	910	0
November.....	792	0	857	1	982	0	737	0	850	0
December.....	716	0	911	0	933	0	703	0	842	0
1948										
January.....	763	0	875	0	909	0	719	0	770	0
February.....	737	0	791	0	956	0	624	0	575	0
March.....	767	0	830	0	951	0	717	0	815	0
April.....	825	0	834	0	964	0	819	0	792	0
May.....	838	0	846	0	906	0	860	0	756	0

¹ Source: Navmed 582, Monthly Morbidity Reports, June 1945 through May 1948.² Report not received.³ During the latter part of October and the month of November, Ship No. 2 experienced another outbreak of at least 54 cases.

Vaccines and placebos.—The following preparations were used in the trial: The parenteral *Shigella* vaccine consisted of a heat-killed, merthiolate-preserved, suspension of *S. flexneri III* (Be) with approximately 2.5 billion organisms per ml., and was standardized to contain 9.2 mg. N/100 ml. The oral *Shigella* vaccine was incorporated in enteric-coated tablets that weighed about 1.2 gm. each and measured 14 mm. in diameter and 6 mm. in thickness. Each tablet contained 20 billion heat-killed *S. flexneri III* (Be) organisms plus 75 percent of the dried supernatant medium in which they had been grown. The parenteral placebo consisted of a heat-killed, phenol-preserved suspension of *Salmonella typhi* that contained approxi-

mately 2.0 billion organisms per ml. The oral placebo was an enteric-coated tablet composed of powdered sugar and magnesium carbonate which, during compression, was lubricated with zinc stearate; the enteric coating consisted of edible shellac and terra alba. The tablet duplicated in size, shape, and color that carrying the oral vaccine but contained no *Shigella* organisms.

The usual sterility and safety tests were performed with satisfactory results with the materials described above. In addition, tests in mice using both oral and parenteral *Shigella* vaccines revealed the absence of toxicity but a high antigenicity of each preparation; the placebo tablets were neither toxic nor antigenic in mice in similar experiments (46). As an added precaution, the parenteral *Shigella* vaccine was injected subcutaneously in graded dosages to 16 volunteers from the staff of the Bacteriology Division. These individuals were observed carefully, both objectively and subjectively, at intervals of 1, 6, 12, 24, and 36 hours after administration of the material. The results showed that the vaccine was no more toxic than the TAB vaccines employed in routine inoculations.

Vaccine groups.—After consultation with various authorities, it was decided to administer *Shigella* vaccine in one form or the other to 50 percent of the personnel on each ship; the remainder of those included in the program were scheduled to receive the placebos and served, therefore, as a control group. Ships' companies aboard each vessel were, consequently, divided into three experimental sections within each division as follows:

1-A Group.—This group comprised 25 percent of the crew and each individual was inoculated with 3 weekly subcutaneous injections of parenteral *S. flexneri* III (Be) vaccine; this material was designated as S-3. The doses were 0.5, 0.5, and 1.0 ml. respectively, thus making a total of approximately 5 billion organisms. In addition, each subject received 1 placebo tablet, designated 0-0, daily for 15 days.

1-B Group.—This section consisted of 25 percent of the crew. Each subject was given 1 tablet of the oral *Shigella* vaccine, designated as 0-3, daily for 15 days. In addition, each individual was scheduled to receive 3 weekly subcutaneous injections of the parenteral placebo, which was labeled T-S.¹

2-A Group.—This control group consisted of 50 percent of the crew. Each individual received one placebo tablet (0-0) daily for 15 days plus a scheduled course of 3 weekly subcutaneous injections of parenteral placebo (T-S).¹

¹ Due to certain technical circumstances, the dosages of T-S vaccine varied on the different ships. The vaccine was entirely omitted on ship No. 2; on ships No. 1 and No. 4, the dosages were 0.5, 0.5, and 1.0 ml. On ship No. 3, the amounts injected were 0.3, 0.3, and 0.3 ml.; and, on ship No. 5, the injections were 0.5, 0.5, and 0.5 ml. respectively.

For the purposes of this study, all officers on each ship were considered as a separate division and were divided into groups as described above.

General procedures.—In March 1948, a group comprising the research team was ordered to a West Coast activity where the five cruisers were based. The unit consisted of 3 officers and 13 enlisted laboratory technicians; 10 of the enlisted men were issued orders directly to the ship, 1 Hospitalman Chief and 1 assistant being assigned to each vessel. Laboratory and office headquarters for the project were established in the Dispensary located on the Naval Base. According to prearranged schedules, as the vaccine program was initiated aboard each ship, a team from the project headquarters consisting of 1 officer and as many enlisted technicians as were required, were issued temporary duty orders to the vessel to assist the 2 men permanently assigned; the duration of such temporary duty varied from 3 to 6 weeks depending upon operational schedules of the ships.

Histories.—A careful history was obtained by interview from each subject prior to administration of vaccine and the data recorded on printed forms. Case history forms were filled out in triplicate; the original and 1 copy were kept in the files of the officer in charge and the third copy was retained aboard ship. In addition to name, age, length of service, and other general demographic information, the following points were considered:

(a) Presence in previous epidemics of shigellosis in the Pacific Fleet. Replies of the subject made to questions were checked by referring to health and service records and to lists of all known ship-board outbreaks subsequent to May 1945.

(b) Previous gastro-intestinal illness, either epidemic or sporadic. Illness was recorded only if the subject had been sick enough to receive medical attention for gastro-intestinal symptoms with fever.

(c) The numbers and results of previous rectal swab cultures and any evidence that the subject had been detected as a carrier of an enteric pathogen, particularly *S. flexneri* III. Replies to questions regarding these points were also checked by consulting health and service records.

(d) Any history of allergy or untoward reactions to administration of routine vaccines.

Each individual was assigned a serial code number which was recorded on the case history and other forms.

Cultures.—Three pre-inoculation rectal swab cultures were scheduled for each subject at intervals of 1 or 2 days. The fecal specimen from each individual was streaked directly onto one-half the surface of a plate of S S (*Salmonella-Shigella*) agar. After incubation at 37° C. for 16 to 18 hours, colonies suspected of being enteric pathogens

were restreaked onto divided sections of MacConkey agar plates for purification and these in turn were incubated at 37° C. for 16 to 18 hours. Suspicious colonies appearing on MacConkey agar plates were gram-stained and, if pure cultures of gram-negative bacilli were found, were inoculated into TSI (triple-sugar-iron) medium. If the results in TSI medium, after 18 to 24 hours incubation at 37° C., so indicated the culture was inoculated into semisolid medium for a motility test and into urease test medium to check for members of the genus *Proteus*. As part of the supplies and equipment placed aboard each ship for the duration of the vaccine program, quantities of *Shigella* typing serums and polyvalent *Salmonella* serum were provided. If the results of the cultural screening tests suggested that a member of one of these genera had been isolated, the organism was further checked by serologic procedures. For the purposes of this study, only organisms found to be either a *Shigella* or *Salmonella* were recorded as pathogens, but members of the *Paracolon*, *Proteus*, and *Pseudomonas* groups isolated were preserved for possible future examination. All cultures suspected of belonging to either the genus *Shigella* or *Salmonella* were forwarded to the Bacteriology Division of the Naval Medical Research Institute for final identification; a copy of each such culture was retained aboard until receipt of a report of the official identification.

Any patients admitted to the sick list with gastro-intestinal complaints were scheduled for daily rectal swab cultures to a maximum of 10 days or until at least three consecutive cultures were negative for pathogens and the patient became asymptomatic.

Results of the cultural studies were not disclosed to the subject or to any member of the ship's company. It was planned that carriers of *S. flexneri* III detected during the program were to carry out their routine duties. This was done because it was desired that no attempt be made to isolate carriers or in any other manner interfere with the natural history of the infection aboard ship except for possible effect of the vaccines administered.

Serums and stool extracts.—Prior to administration of the vaccines, and at intervals thereafter varying from 2 to 101 days, specimens of blood and feces were collected from subjects included in the program. Serums were drawn from the blood samples and used in agglutination and mouse-protective tests to determine the effect of the vaccines in increasing humoral antibody levels. Extracts of the stool specimens were made with formalinized saline for use in assaying coproantibody contents by agglutination and, if feasible, mouse-protective tests. Serum agglutination tests were performed as soon as possible after which the samples were frozen and maintained in this condition until mouse-protection tests could be started. Stool ex-

tracts were also frozen as soon as possible after preparation and kept in dry ice chests until laboratory examinations were begun.

Administration of vaccines.—A team of at least three members of the research group administered the parenteral vaccines; one member of the group was responsible for ensuring that the subjects received the correct vaccine by reference to, and proper recording on, a check-off list. Injections were given according to the schedule described in a previous section; a supply of epinephrine hydrochloride, 1:1000, was kept at hand during all injections. Check-off lists were used also during administration of the tablets which were swallowed by the subjects under supervision.

Replacement personnel.—When personnel included in the program were detached from the ship and replacements reported aboard, the new men were assigned to vaccine groups in such a manner that the original ratios in the three groups were preserved. Replacement personnel received aboard during the first 6 months only after initiation of the program were included in the study; pre-inoculation cultures, blood and stool specimens were not taken from these subjects.

When an individual was transferred from one ship to another included in the program, his case history and other records pertaining to the study were forwarded to his new station; such a subject was kept, therefore, in his original vaccine group.

There was a large number of replacements and an appreciable number of intership transfers.

Follow-up studies.—A shipboard follow-up period of 1 year subsequent to administration of the vaccines was originally planned; the scheduled termination dates of the studies aboard the ships varied from 1 June 1949 to 15 August 1949. Decommissioning of ships 1, 2, and 3 prior to these dates, however, shortened the programs aboard these vessels to approximately 9, 7, and 7 months, respectively. Follow-up studies included the procedures listed below.

(a) Rectal swab cultures were scheduled for all personnel included in the program once every two weeks. Although it was recognized that such an infrequent sampling could not be expected to detect all carriers each time (8), it was hoped that over an extended period of time the majority of such individuals might be discovered. Limitations in procurement of qualified technical personnel and other practical considerations determined the frequency of culturing. The procedures employed were identical with those described in a previous section.

(b) As soon as possible after replacements reported aboard, usually within 2 days, case histories were obtained from the new men, they were assigned to the proper vaccine group, were scheduled for their inoculations, and were entered on the check-off lists for regular cultur-

ing. As soon as inoculations were completed, the original and one copy of the case history were forwarded to the officer in charge.

(c) The Hospitalman Chief permanently assigned to each ship for the duration of the program was charged with the responsibility of submitting complete reports once every 2 weeks to the officer in charge. This procedure served to maintain up-to-date entries on case histories and to keep the officer in charge fully informed as to progress of the program aboard the five cruisers. When subjects were admitted to the sick list with symptoms of gastro-intestinal illness, in addition to daily culturing and entries on the original case history, a case history form for this disease, Navmed 1168, was filled in for the patient. If the cultural results indicated that a *Shigella* or *Salmonella* was the etiologic agent, the original of Form 1168 was forwarded to the Naval Medical Research Institute together with all suspected cultures. Special reports and correspondence as indicated were employed to maintain close liaison between the field representatives of the program and the central office.

(d) It was originally planned that booster doses of *Shigella* vaccine were to be administered approximately six months after completion of the initial courses; due to ship movements and other factors this procedure could not be carried out. It was possible, however, to conduct a study of the effect of booster doses of parenteral *Shigella* vaccine in a group of 104 officers and men on ship No. 3. Samples of blood were taken from each subject just prior to the inoculations. Each individual was then given a single subcutaneous injection of 0.5 ml. of the *S. flexneri* III (Be) vaccine (S-3); reactions to these doses were minimal. At three different intervals after administration of the booster dose, blood was drawn from the subjects in groups as follows: 7 days, 36 men; 14 days, 40 men; and 21 days, 28 men. Serums thus obtained were frozen as soon as possible and stored for subsequent comparisons of the antibody levels before and after inoculation by agglutination and mouse-protective tests.

(e) The collection of all data was planned in such a manner that statistical analyses may be readily made at the conclusion of the field trial. In the event of an epidemic of dysentery aboard either of the two remaining ships, it has been planned that careful and intensive clinical and epidemiological studies be made in order that ultimate evaluation of the efficacy of the vaccines in the prevention of human shigellosis may be accomplished.

DISCUSSION

A variety of factors recognized over a period of several years contributed to the formulation and initiation of the field trial of *S. flex-*

neri III vaccines described in this report. The extensive epidemics of shigellosis that occurred in 1945 in the Leyte Gulf and Tokyo Bay, while of serious significance from the standpoint of preventive medicine, could have been disastrous to the war effort had they appeared during strategic fleet operations. Recurrent shipboard outbreaks subsequent to 1945, and as recent as the latter part of 1947 and early 1948, showed that the problem was continuing and that measures employed for control and prevention of the disease were ineffective. The etiology was unique in that the causative organisms were invariably *S. flexneri III*, frequently with varying amounts of minor antigens, and were highly resistant to the sulfonamides. Although clinical evidence suggested that streptomycin was effective in a number of instances, it must be predicated that it may be only a matter of time until the organisms lose their sensitivity to this antibiotic and probably to others as they appear. Numerous asymptomatic carriers of *S. flexneri III* had been detected among personnel aboard various ships of the Pacific Fleet. Furthermore, evidence suggested that men who were relatively new to the naval service, and hence presumably with a lower previous exposure rate to the organism, represented the group with the highest incidence of disease during an outbreak. In view of the practical impossibility of detecting, isolating, and effectively treating all carriers, the obvious solution to the problem appeared to be an attempt to prevent the susceptible personnel from acquiring the disease. Inoculation with vaccines composed of the *Shigella* type responsible for the epidemics seemed, therefore, definitely to be indicated. Every effort was expended to provide adequate controls in order that a thorough trial of the procedure could be expected; about 6,000 officers and men were included in the program, one-half of whom received placebos only. Obviously, no attempt to alter the natural history of the infection aboard the five cruisers by removing or isolating carriers detected during the study could be permitted. The most convincing information regarding the efficacy of the vaccines was believed to be the occurrence of an epidemic aboard at least one of the ships during which careful epidemiologic analyses would be made. Without such an eventuality, evaluation of the procedures must rest upon circumstantial evidence and upon the outcome of laboratory results of tests with the specimens collected; data regarding these form the bases for subsequent reports in this series.

SUMMARY

Recurrent shipboard epidemics of dysentery due to *S. flexneri III* since 1945 have presented a serious problem to the Navy. The causative organisms have been shown to be highly resistant to the sulfona-

mide drugs. Numerous asymptomatic carriers of the organisms have been detected aboard various ships in the Pacific Fleet. Evidence has suggested that when sufficient numbers of susceptible replacement personnel have reported aboard the ships, and other factors operated, an outbreak has been likely to occur. The measures so far employed for control and prevention of such epidemics have been ineffective and, in view of the unique circumstances, a field trial of the efficacy of vaccines composed of *S. flexneri III* was organized and initiated aboard five light cruisers of the Pacific Fleet.

Each of the ships selected for the study had experienced at least 1 epidemic of shigellosis subsequent to 1945. Approximately 6,000 officers and men aboard these vessels were included in the program. Studies prior to administration of the vaccines included the careful taking of comprehensive case histories from each subject, the obtaining and processing of three rectal swab cultures from each individual, and the securing of blood and stool specimens for serum and fecal antibody determinations.

Personnel within each division on the ships were assigned to one of three vaccine groups in the following manner: (a) Group 1-A, 25 percent, received 3 weekly subcutaneous injections of parenteral *S. flexneri III* vaccine in doses of 0.5, 0.5, and 1.0 ml. respectively plus 1 oral placebo tablet daily for 15 days; (b) group 1-B, 25 percent, was given 1 tablet of oral *S. flexneri III* vaccine daily for 15 days plus courses of parenteral placebo that varied in amounts on the different ships; and (c) group 2-A, 50 percent, to which was administered 1 placebo tablet daily for 15 days plus courses of parenteral placebo that varied in amounts on the different ships. Inoculations of the *Shigella* vaccine were tolerated well and no untoward reactions were encountered.

Follow-up studies aboard each ship were originally scheduled for 1 year after administration of the initial courses of vaccines; decommissioning of 3 of the 5 ships has resulted, however, in terminating the studies on these vessels after only 7 to 9 months. Post-inoculation studies included: (a) The taking of rectal swab cultures on all subjects once every 2 weeks; (b) inoculations of replacement personnel received aboard during the first 6 months; (c) compiling, forwarding to the central office, and processing of semimonthly reports from each ship; (d) the taking of daily rectal swab cultures from sporadic cases for an average maximum of 10 days; (e) a study of the effect of a parenteral booster dose of 0.5 ml. of *S. flexneri III* vaccine in a selected group on 1 ship; and (f) laboratory assays of antibody levels in serums and stool extracts collected before, and at intervals varying from 2 to 101 days after, administration of the initial courses of vaccines.

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Some Recent Advances in Aviation Medicine

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THE greatest advances in aviation medicine in recent years have been in the fields of adapting the pilot to his rapidly changing environment. This has necessitated extensive studies in basic physiology and psychology in order to define his tolerances and limitations. The rapid increase in speed, range, altitude, and performance of aircraft has tended to exceed man's physiologic limitations and medical science has been pressed to keep pace. In addition, the increased stresses on and requirements of pilots have also further stimulated efforts to improve the selection, training, and maintenance of pilots and air crews to operate modern high performance aircraft. The discussions of these advances and developments have been broken down principally into the stresses and environmental factors involved.

ATMOSPHERIC AIR PRESSURE CHANGE

The oxygen requirements of man during flight at high altitudes have been accurately determined in recent years and in itself does not present a problem for the future. There is a great deal to be learned about man's ability to acclimatize to high altitudes and the fact that this factor will play on his ability to attain great altitude in flight. Oxygen apparatus of the conventional type, designed to meet the physiological requirements of man, has been developed which will maintain normal blood oxygenation up to 35,000 feet. With the addition of the pressure breathing feature to this equipment, the flier is now able to ascend to 43,000 feet and maintain a normal range of blood oxygenation.

The problem of anoxia above 43,000 feet has been and is being pursued and will undoubtedly be partially answered in the future with the development of pressurization of aircraft cockpits and cabins and the emergency use of pressure suits in the event of cockpit pressure failure or escape from aircraft above 50,000 feet. An increase in

tolerable altitudes by previous partial acclimatization may also be a possibility for the future. However, this method would have obvious limitations and would provide at best only an additional 1,000 or 2,000 feet in the altitude range between 43,000 and 50,000 feet.

Other equipment developed recently to combat anoxia has been parachute escape oxygen equipment for high altitude parachute descents and the use of liquid oxygen as a source of gaseous oxygen for use in aircraft. One of the favorable characteristics of liquid oxygen is the saving of critical space and weight in aircraft. However, the development of this equipment has been attended with considerable difficulty from evaporation losses, supply of high peak flows under certain requirements, attitude of flight influence on the delivery of oxygen from the converter, and the hazards of fire and explosion. All these difficulties are being gradually overcome and the use of liquid oxygen converters in aircraft will undoubtedly be more general in the future.

The design and specification of the pressure cabin from a physiological standpoint required answers to three fundamental requirements: (a) The prevention of anoxia; (b) adequate ventilation and temperature control; and (c) the prevention of decompression illness symptoms. The hazards in the use of pressure cabins at altitudes in excess of 43,000 feet lie in the events which transpire after a sudden loss of cabin pressure commonly spoken of as explosive decompression. The most important consideration in this respect is the prevention of fulminating anoxia during the descent to lower altitude. As an answer to this problem, the development of the pressure suit for such an emergency is progressing with considerable satisfaction. The pressure suit not only will prevent the development of severe anoxia but also the escape of dissolved gases such as nitrogen into the blood stream and tissues and so avoid the symptoms of severe decompression illness.

The problem of decompression illness has been recognized and its incidence above 30,000 feet altitude is well known. Recent studies have shown the influence of many important factors on the incidence of aviators' "bends," such as exercise, environmental temperatures, age, frequency of exposures, and trauma. It has also been shown that an individual's tolerance to decompression can be classified into one of three groups; (a) Resistant to decompression; (b) susceptible to decompression; and (c) intermediate group. Variation in tolerance may take place after prolonged periods of frequent exposures to altitudes in excess of 30,000 feet.

One of the important realizations in the problem of decompression illness has been the onset of delayed symptoms and its treatment. All too frequently persons who have been exposed to low atmospheric

pressures and who have developed symptoms of decompression illness, have had a recurrence of symptoms of a more severe nature in from 2 to 6 hours following recompression. These symptoms are scotomata, headache, low blood pressure, chest pain with elevated respirations, paresis or paralyzes of extremities, and varying degrees of unconsciousness. The need for a follow-up of all persons with symptoms during decompression and the prompt initiation of supportive therapy has been pointed out.

It has been widely demonstrated that much of the difficulty with decompression illness can be prevented by breathing 100 percent oxygen from one half to one hour before decompression. The use of this pre-oxygenation procedure will eliminate the majority of cases of decompression illness. However, this might not be practical for the modern high speed interceptor aircraft under combat readiness conditions.

The study of the incidence of decompression illness at altitudes below 30,000 feet has been of importance in regard to the design of pressure cabins. In order to eliminate decompression illness symptoms as far as possible, ideal pressure levels within cabins should be below 30,000 feet and as near to 20,000 feet as is practical from the engineering design point of view.

ACCELERATION

Prior to World War II, the field of acceleration was not given a great amount of attention. This was probably due to the fact that the speed of the aircraft in use was not great. However, as the speed and performance increased, the problems resulting from high accelerations also increased and research was required to establish man's limitations and tolerances to the various forms of accelerations and decelerations, and to provide means of protection against these forces.

In considering acceleration, it is necessary to consider the kind; linear, radial, or angular; the duration; the magnitude; and the direction of the force with respect to the pilot or aircraft, positive, negative, or transverse accelerations.

Linear acceleration or deceleration is encountered in aircraft crashes, in parachute opening shocks and landings, in the use of ejection seats and so on.

Considerable strides were made during the war years in protecting the pilots from crash injuries. First, among these was the development of and use of the shoulder harness and subsequently the increase of the strength of the harness and lap belt. Following this, and unfortunately largely on the basis of information obtained from accidents and attempted suicides, the strength requirements of aircraft seats was increased from a figure around 10 G to a figure of 40 G.

(By this is meant that the seat, seat back, and supporting structure would not break or tear loose even though supporting 40 times the weight of a 200-pound man in a crash). This has been a requirement of all Navy operational carrier aircraft since 1945 and it has paid dividends in the saving of lives. In conjunction with this, the harnesses and seat belts have been similarly strengthened and a device known as the inertia reel has been developed for attachment to the shoulder harness to permit necessary mobility in the cockpit under normal conditions but which acts to lock the shoulder harness in a crash condition. This was necessary to overcome the personal equation: the tendency to forget to lock the harness before landing or in an emergency. Additional research has been carried on in order to eliminate protruding objects, knobs, structural members, and so forth from the pilot's vicinity and so obviate a factor in head and face injuries during crashes. Results are being obtained from research to redesign instrument panels and mountings which will yield before serious head injuries occur. This is particularly important in the light plane where the cockpit and seat strength cannot approach that of military aircraft.

Protective helmets have been developed and are of great benefit especially to pilots flying high-speed jet aircraft. These helmets have already saved lives and valuable aircraft.

Reduction of crash injury to personnel and passengers of large bomber, patrol, and passenger aircraft has been and is being accomplished by establishment of ditching procedures, by increasing the strength of the seats, seat belts, and attachments, and by the use of backward-facing seats. Intensive research is continuing in this highly important field.

Problems resulting from the use of parachutes have received considerable attention, but much more work is required. An automatic parachute opening device has been developed, which, however, requires additional improvements. Improvements of parachutes to reduce opening shock have been made and work is progressing toward development of an improved parachute harness.

The problem of escape from aircraft is no longer a simple matter of bailout. The tremendous speed of modern aircraft combined with alterations in the configuration of aircraft which place propellers, wings, and the tail of aircraft in the path of escape of the pilot, has required the development of new methods and means of escape. Of principal interest in this regard, has been the development of the ejection seat. This required first, the definition of man's tolerance to forces acting through the spinal column. By the use of the ejection seat tower, it was determined that man in the seated position would withstand a force of 20 G or more acting for approximately 0.1

second. Engineers were then able to design a seat and catapult gun which would not exceed these limitations while ejecting the man 60 feet into the air. This height is sufficient to clear the tail of a high-speed aircraft. Additional problems were encountered with regard to man's tolerance to wind blast at these high speeds, and the need for a protective face curtain on the ejection seat. A drogue chute was devised to stabilize the seat and to prevent tumbling in order not to exceed man's tolerance. Further research is continuing in this field of defining man's limitations in still higher speed aircraft which present new emergencies and will probably require the ejection of a complete capsule to protect the pilot from wind blast, accelerations, low barometric pressures, cold, and so forth.

One of the outstanding contributions of aviation medicine was the research leading to the development of a comfortable, practical anti-blackout suit for protection against the effects of positive radial acceleration. This suit acts to prevent the pooling of blood in the lower extremities and abdomen resulting from the centripetal force (positive "g") developed in high-speed turns and maneuvers of fighter aircraft. This suit raises the blackout threshold, largely eliminates the danger of unconsciousness from high "g," and also reduces the fatigue effects of combat maneuvers, particularly over-head gunnery runs, hence it maintains the pilot in a more alert and efficient condition.

Further work is continuing toward increasing g-protection by improving the g-suits and by exploiting the possibilities of the prone and the supine positions.

Studies have been made toward further defining man's limitations to negative "g" (force acting from foot-to-head), and toward understanding the physiological factors involved.

Angular acceleration or rotation about the long axis of the body results in vestibular stimulation and in situations where insufficient visual references are available disorientation of the pilot may result. Intensive research has resulted in some improvement of aircraft instrumentation so as to provide adequate visual references. However, additional research and improvement of instrumentation is in progress.

HUMAN ENGINEERING

The field of human engineering in general has been concerned with the improvement in the design and arrangement of controls and instruments. Its contributions in aviation medicine have been particularly noteworthy in the development of the functional cockpit. This has resulted in a cockpit which has standardized the locations of various instruments, switches, and controls so as to reduce and eliminate confusion and errors in their use. For example, controls for operating landing flaps, wheels, dive brakes, and bomb bays were formerly iden-

tical or very similar to one another and were located in different places in the different aircraft. The inevitable result was that pilots lowered the dive brakes instead of raising the wheels and this caused the aircraft to stall and crash. Now, the handle of the control is characteristic, i. e., the wheel control is shaped with a wheel on the handle, the tail hook control is shaped like a tail hook, and so forth. Further a particular location in the cockpit has been assigned for each such control and instrument. This largely eliminates the relearning process, or the confusion in transferring from one aircraft to another.

The instrumentation dials have been a source of difficulty. Errors in interpretation were due to the excess markings, size of numerals, and complex numbers of pointers on one instrument such as the altimeter, etc. As a result of efforts in this field, the instruments are being improved as to readability, are arranged in functional groupings and are placed in standardized positions. Even so, the increased complexity of tasks combined with high speed flight requires radical changes in instrumentation and navigation procedures so as to supply more and more information automatically or in a "yes" or "no" manner to reduce the reading and integrating time required of the pilot.

New high-speed aircraft are being equipped with more adequate heating, cooling, and ventilating systems and more effort is being spent in improving pilot comfort and reducing pilot fatigue.

TOXICOLOGY IN AVIATION

Noxious gases from the exhaust of aircraft engines create an important problem in aviation. The most important, carbon monoxide is always found wherever fuels are burned to create fire for heat or for locomotion. It is, therefore, a gas which has been a problem to humans for some time. The following information is the result of recent researches.

Since both oxygen and carbon monoxide are carried by the blood in a similar manner the presence of carbon monoxide therefore tends to limit the amount of oxygen which can actually be carried by the blood. As a result, an anemic type of anoxia can occur rapidly since the affinity of carbon monoxide for hemoglobin is 210 times that of oxygen.

Carbon monoxide poisoning may occur in aircraft in a number of ways. The source is always the exhaust fumes but the manner of entering the cockpit or cabin may be one of several ways. A preventive problem, therefore, has centered about the elimination of all possible sources of entrance for carbon monoxide to the cabin or cockpit.

The important factors in the degree of poisoning are: (a) The concentration of the carbon monoxide in the inspired air; (b) the ventilation rate; and (c) the length of time the gas is inhaled. These

three factors determine the degree of carbon monoxide saturation of the blood.

The therapy in carbon monoxide poisoning is: First, removal of the source of gas; and second, the administration of either uncontaminated air, or better still, 100 percent oxygen. While in flight this therapy can be instituted by the wearing of the oxygen mask and the breathing of pure oxygen. The use of the oxygen apparatus will greatly speed the removal of carbon monoxide from the blood and prevents any further entry of carbon monoxide into the lungs.

With jet and rocket fuels being used more generally, the toxicological nature of both the propellant and the exhaust gases must be understood. There are a large number of propellants which are being used and being considered for use in jet engines. JATO (Jet Assisted Take Off) units and rockets of which the composition and toxicology of the exhaust gases is unknown, will also be studied. The methods of handling and the precautions to be taken must be outlined in the very near future. Protective clothing is under development for personnel handling jet propellants, particularly on aircraft carrier decks.

NOISE AND VIBRATION

Of recent interest in aviation medicine has been the problem of the effects on the human being of noise and vibration over a wide frequency range with high intensities. With the advent of the jet and rocket power plants in aircraft this problem required investigation in order to determine the protection necessary for both air crews and ground personnel. Considerable difficulty has been experienced in securing the proper instrumentation for high frequency studies, although at the present time much of this problem has been solved.

The biological effects of vibration stimuli begin as far down the scale as the slow accelerations which are commonly referred to as "g" forces. These forces are described in the discussion of the problems of acceleration. Low frequency alternating motion can be considered as the next step in the vibration scale. This frequency is related to the problem of motion sickness and to disorientation. The next range upward of vibratory frequency affects the proprioceptive system. From 20 CPS one begins to enter the auditory range. At frequencies from 20 to 20,000 CPS and with intensities up to 160 decibels, hearing may become impaired. At such sound levels position reflexes may be stimulated, making it impossible to perform fine movements. Fatigue likewise may rapidly be felt. In the middle or lower auditory range certain frequencies are found which affect the eyeball and may result in blurred vision. The ultrasonic field of vibration is considered to be that above 20,000 CPS.

Little is yet known concerning the effect of airborne ultra sound. Certain laboratory animals have died when exposed to various levels of ultra sound. It may be that ultra sound has deleterious effects on certain human physiological mechanisms. There is a vast amount of investigative work involved in the study of the effect of high frequency airborne sound on specific systems and tissues of the body. At present it appears that the high frequency *per se* has little or no deleterious effects on the human being.

On the other hand high intensity noise in a wide range of frequencies has been found to have considerable harmful effect upon the hearing as well as the vestibular mechanisms. Recent experimental evidence gathered from exposures of animals to the noise and vibrations in jet engine test cells has demonstrated the fact that damage to the auditory mechanisms which may be permanent does occur. This then seems to justify the need for the development and use of protective devices when personnel are working in the immediate vicinity of jet and rocket engines.

Speech intelligibility over intercommunication and radio systems is complicated by the noise problem. This problem has been thoroughly studied recently and further work is necessary in order to continue to improve communications in, to, and from aircraft. Engine noise in jet aircraft has decreased, but the difficulty in speaking at low atmospheric pressures in high altitude flight has continued to be a problem.

VISUAL PROBLEMS IN AVIATION

The recent trends in visual problems in aviation has centered about: (a) Night vision; (b) the improvement of instrument panel lighting; (c) the improvement of aircraft exterior lighting, in order to eliminate false visual clues while night flying; and (d) the study of materials with good visual properties for canopies and viewing ports.

Night vision training has gained emphasis over night vision testing, for it is apparent that most of the personnel entering military service know very little concerning how best to see an object or use a scanning technique at night. The incidence of poor night vision is very low. Since night vision training can serve the purpose of testing, the need for specific testing is obviated.

Considerable work has been done on the problems of instrument and cockpit lighting. The use of ultraviolet and red lighting systems have been and are being thoroughly studied. There is a great need for a type of lighting system which will provide adequate visibility as well as a low or negligible fatigue effect upon the eyes.

Since it has been demonstrated that certain illusions are caused in part by the fixation of vision upon a single light source, the problem of redesigning exterior lighting systems for aircraft has come to the

fore. Longitudinal or vertical strips of light have been proposed as well as multiple lights in a single given visual area. It is hoped that such changes will eliminate the problem of avoiding such unfortunate circumstances as flying wing on stars, ship's truck lights, etc.

The need for new type materials with high optical qualities for cockpit canopies and viewing ports of aircraft is great. In naval aviation the problem of properly visualizing the landing signal officer of an aircraft both during the day and at night is a continuing one. Cockpit positioning, canopy design, as well as the optical properties of the landing signal officer's equipment at night are problems currently being investigated.

With high speed flight comes the problem of visual reaction times and their coordination with complex motor functions in flying and fighting the aircraft. Problems of relative motion during high speed flight place a terrific burden on the pilot. The solution may result in "electronic eyes" replacing the human eye for distant vision.

PSYCHOLOGY IN AVIATION

A most important contribution of a psychological nature to Aviation Medicine of late has been in the field of selection of pilot personnel. This development got underway in the Navy as early as 1941 and consisted first in the development and selection of paper and pencil psychomotor performance tests. These various selection tests were evaluated in the light of the success or failure of a group of aviation cadets in flight training. Three tests were finally selected for incorporation into the actual selection testing program. These tests were: (a) Aviation Classification Test, a test of general learning ability cast in an aviation setting; (b) mechanical comprehension test, an essentially "barnyard physics" type of test; and (c) a biographical inventory which takes into account the individual's background, his interests and accomplishments.

As a result of these tests prediction of the success or failure of a candidate for flight training can be made more accurately than by the personal evaluation made by a flight surgeon.

At the present time studies are continuing in the field of selection and maintenance, for although the early results in this type of study resulted in a great improvement in selection of aviators, it has not proved to be as satisfactory as is ultimately desired.

SURVIVAL IN AVIATION

Since there is such a great deal of over-water operation of aircraft, the need for the development of adequate survival equipment was imperative. Adequate life rafts, life vests, rations, and water supply

were developed as well as assorted smaller items for aid in location and rescue.

The problem of water supply still remains a major problem in survival at sea. Recent developments in supplying water to castaways at sea involve the desalinization kit and the solar still. The desalinization kit consists of a plastic bag into which a certain amount of sea water is placed and a briquet of chemical material added. The briquet is dissolved in the sea water resulting in a neutralization of a large part of the sodium chloride in sea water. The resulting water is potable although its taste is not always satisfactory to the individual. The solar still finally developed had a capacity of approximately one liter per 24 hours under ideal conditions. However, since ideal conditions do not always prevail, it is capable of only something less than its rated capacity. In Arctic waters the cold causes the plastic to crack when being unpacked and the lack of sunlight also contributes to its poor output.

Nonmedical equipment of various types has been developed including rigid boats fully equipped as well as inflatable rafts equipped with a power source, sails, provisions, and water.

For the problem of locating lost persons down at sea, the following nonmedical equipment was also developed: (a) The corner radar reflector which would send back the radar from the searching aircraft or surface vessel; (b) dye markers made of a fluorescent material easily spotted from the air in order to locate a person adrift in a life jacket or a raft; (c) a simplified Very pistol as well as other pyrotechnical equipment to aid in locating personnel at night; (d) the ordinary whistle was adapted to survival at sea techniques and proved successful on many occasions; and (e) the "Gibson Girl," a portable radio transmitter, was also made available for assistance in survival and rescue.

A light-weight life raft along with assorted items such as water supply, rations, a radar corner reflector, dye marker, fishing gear, and a Very pistol were included with the parachute in a pack which was developed and called the para-raft kit. This development was one of the most beneficial survival items recently developed. Small kits for first aid to be carried in the pocket or fastened to the belt were also developed. Techniques for purification of water obtained from land sources once the individual reached a strange shore were also pointed out. The introduction of survival training, together with the equipment developed, remarkably improved air crew morale in the operation of aircraft over the sea.

This summary of recent advances in Aviation Medicine has covered only some of the more general fields of Aviation Medicine and is in no way intended to be an all-inclusive report on progress in

this field. The contributions in Aviation Medicine resulted in the gathering of small bits of basic knowledge which have been welded together or used independently in the development of information, techniques and material for the protection of the aviator in his flight.

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Clinical Case for Diagnosis

WILLIAM O. UMIKER *Commander (MC) U. S. N.*

A 48-year-old white man entered a naval hospital complaining of chills, fever, prostration, and suprapubic pain of 6 days' duration.

Upon returning from a fishing trip, during which time he was exposed to inclement weather, the patient suddenly became ill. He experienced chills, fever, malaise, and "slightly stabbing" suprapubic pain. This pain radiated to the back and to the right testis. Two days later he had emesis of greenish-yellow material. Two days prior to admission he noted passage of two black, tarry, sticky stools. Past history disclosed that he had been treated for "duodenal ulcer" for several years. Two years before admission he had had an attack of "colitis" characterized by loose stools containing considerable mucus.

Physical examination revealed an obese, febrile, apprehensive middle-aged man. There was a sense of resistance in the suprapubic area with shifting areas of tenderness in both lower quadrants of the abdomen. The liver was palpable just below the costal margin. Rectal examination was not contributory. The temperature was 102° F., the pulse rate 70, the respiratory rate 20, and the blood pressure was 108/80.

Examination of the blood disclosed a red cell count of 4,160,000, Hb. 12 grams; white cell count 16,800, with 93 percent neutrophils of which 75 percent were segmenters, 15 percent were stab forms, 3 percent juveniles, and 1 percent myelocytes. The urine contained no albumin or sugar and the sediment was free of erythrocytes and pus cells. Coprological studies exhibited occult blood only. No pathogenic bacteria or parasites were found. Urine cultures were also negative. Growths of *Escherichia coli*, *alpha streptococcus* and paracolon bacillus were obtained repeatedly from blood cultures. Serum agglutination tests for typhoid, paratyphoid, and undulant fever were negative. Numerous blood smears disclosed no malarial parasites. The icteric index was 19.5. A quantitative Van den Bergh was 2.2 mg. percent with a positive direct reaction. The urine became positive for bilirubin with normal quantities of urobilinogen. The serum alkaline phosphatase was slightly elevated (7.2 Bodansky units) and the esterified cholesterol of blood serum decreased (30 percent). Thymol turbidity tests, cephalin flocculation tests, total serum cholesterol, and prothrombin levels were all within normal limits.

Flat plates of the abdomen showed no air under the diaphragm. Chest roentgenograms were negative. An intravenous pyelogram and a thorotrast injection were not revealing.

The patient's temperature was remittent with a fastigium of 105° F. There was deepening icterus, right upper quadrant tenderness, and hepatosplenomegaly, with the liver palpable 5 finger breadths below the costal margin. Numerous telangiectases appeared in the skin of the upper abdomen. There was questionable ascites. Although his stools continued to show occult blood, the color varied from brown to gray with no evidence of gross blood. Despite massive doses of penicillin (200 million units), streptomycin (24 grams) and sulfa-

diazine (85 grams) he failed to respond, became dyspneic, comatose and died 25 days following admission.

CLINICAL DISCUSSION

At the time of admission, the clinical picture suggested two distinct disease processes. First; with a history of exposure to damp, wet weather followed by chills, fever, and suprapubic pain radiating to the back; urinary tract infection was suggested. However, repeated urinalyses including numerous cultures were negative. Secondly, there was a history of chronic peptic ulcer and the sudden appearance of tarry stools. Interest in the possibility of massive gastro-intestinal hemorrhage lessened when stools failed to show more than occult blood.

Malaria was ruled out by the atypical fever curve and negative blood smears.

A septicemia, produced by organisms commonly associated with intestinal contents, was proved by blood cultures. Attention was drawn to the liver by the appearance of right upper quadrant discomfort, hepatic enlargement, and increasing icterus. Laboratory studies indicated the presence of an obstructive jaundice with only mild hepatic parenchymal damage. Severe and rapidly developed portal obstruction was revealed by the splenic enlargement, ascites, and manifestations of collateral circulation. One could postulate the presence of localized or, more likely, diffuse suppurative infection of the liver. Spirochetal or viral hepatitis could not give rise to bacterial septicemia unless there was secondary infection. The evidence of only mild liver destruction also militated against these diagnoses. However, from the type of organisms recovered from the blood stream and the absence of any extraperitoneal source of bacteremia it seemed much more likely that the hepatitis preceded rather than followed the septicemia. A pyonephrosis, complicated by sub-diaphragmatic abscess, may give rise to direct extension of inflammation into the liver. This possibility was excluded by the absence of evidence of urinary tract infection. We also would have expected an extension through the diaphragm into the pleural cavity if this had been the mechanism involved.

A common duct stone with an ascending cholangitis would explain both the obstructive icterus and the infection. While this could not be ruled out, the absence of any history of biliary disease, severe right upper quadrant pain, and the presence of lower abdominal tenderness opposed this theory.

A perforated peptic ulcer with secondary liver infection was still more difficult to exclude, even with absence of history of severe abdominal pain or muscle spasm.

A sudden development of portal obstruction, the overwhelming infection and the presence of lower abdominal pain and tenderness strongly suggested a suppurative portal thrombophlebitis with multiple small liver abscesses. The obstructive icterus was difficult to explain. The extent of hepatocellular destruction did not appear to be sufficient to produce intrahepatic biliary obstruction. Acute suppurative or gangrenous appendicitis is by far the most common source of pylethrombosis. Other sites such as the pancreas, rectum, or colon could not be excluded. There was no evidence that an area of amebic colitis functioned as the primary site.

Clinical diagnosis.—Acute appendicitis with suppurative pylethrombophlebitis. Multiple small abscesses of the liver. Septicemia.

Pathological diagnosis.—Acute suppurative diverticulitis of the colon with perforation and pericolic abscess formation. Suppurative pylethrombophlebitis. Diffuse suppurative hepatitis. Septicemia. Early biliary cirrhosis.

PATHOLOGICAL FINDINGS

The skin and sclerae were icteric. The colon exhibited multiple diverticuli, many of which were filled with thick, green-yellow, purulent exudate. There was a large perisigmoidal abscess which had dissected through the mesentery almost to the pancreas. Extensive purulent pylethrombophlebitis was present. The liver was enlarged, reddish-yellow and riddled with small grayish-yellow lesions averaging 3 mm. in diameter. The intrahepatic portal veins were also filled with purulent exudate and blood. The common bile duct was partially obstructed by hyperplastic lymph nodes. The gallbladder, stomach, duodenum, and appendix were not remarkable. A large septic spleen was found. Microscopically the sigmoid diverticuli showed a subacute purulent inflammation with extension into the mesentery. The liver was studded with miliary abscesses which were confined to the portal areas. These appeared to be arising from branches of the portal vein. Sufficient periportal fibrosis, bile duct proliferation, and obstructive icterus were present to establish the diagnosis of early biliary cirrhosis.

PATHOLOGICAL DISCUSSION

This case illustrated a much feared complication of intra-abdominal inflammation or surgery. Despite a few recently reported cases of recovery with penicillin, streptomycin, and other antibiotics; the mortality of pylethrombophlebitis remains high. In this instance, massive doses of sulfonamides, antibiotics, and other supportive measures produced no improvement. The case is unusual in that the primary focus was found in an area of diverticulitis, rather than in

the appendix or rectum. The obstructive icterus, caused by the hyperplastic lymph nodes, is of interest.

It is important to divide liver abscesses into single and multiple groups, as well as into amebic and nonamebic groups. The treatment and prognosis differ considerably. The amebic type will not be discussed here. There are many methods of spread of infection to the liver: (*a*) Lymphatic (rare); (*b*) systemic blood supply (hepatic artery); (*c*) direct extension (usually from gallbladder although most infections secondary to cholecystitis arrive via the biliary ducts); (*d*) introduction from outside (wounds); (*e*) bile ducts (common); and (*f*) portal vein (most important and common). According to some authors (1) (2) in from 20 to 60 percent of cases of liver abscesses the primary focus cannot be found. Appendicitis accounts for 10 to 35 percent of the cases. Trauma, cholecystitis, and gastro-intestinal inflammation (other than appendix), give rise to 5 to 15 percent each. Included in the last group are infected hemorrhoids, proctitis, diverticulitis, bacillary dysentery, carcinoma, and ulcerations. *Escherichia coli*, streptococci, and staphylococci are the most frequent organisms recovered from the suppurative areas. The most common complications are pneumonia, lung abscess, and peritonitis. Surgery is of no benefit in the multiple abscesses and the mortality rate in these has been about 95 percent. Recently reported cases of cure with the use of antibiotics offers some hope for the future. The mortality rate for the unoperated single abscess of the liver is also about 95 percent while the operated cases have a 50 percent chance for recovery.

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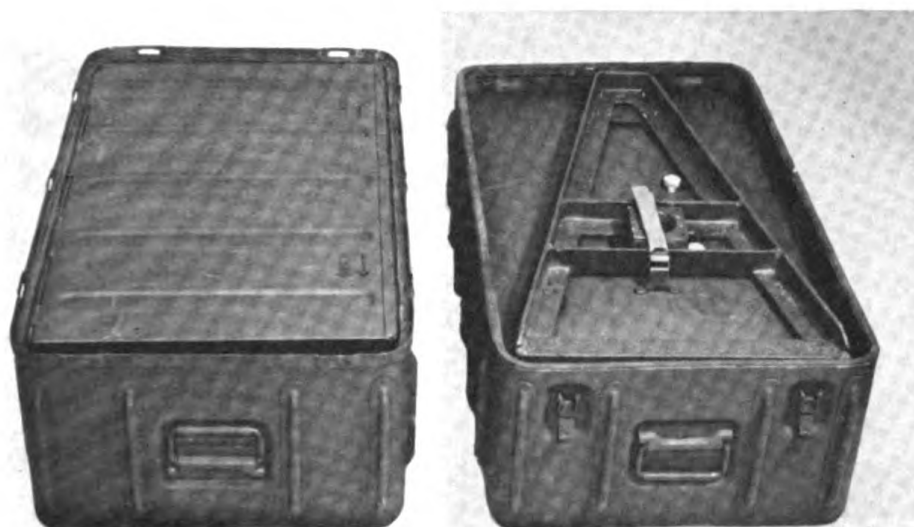
—U. S. Army Photograph

Figure 1.—Portable x-ray stereoscope.

New Portable X-Ray Stereoscope¹

A NEW portable x-ray stereoscope, scaling less than half the weight of commercial models now being used in service hospitals, has been designed by the Engineering Development Division of the Armed Services Medical Procurement Agency at its Fort Totten, N. Y., laboratories. Constructed principally of aluminum and intended for use in mobile field hospitals as a companion item to a lightweight film cassette changer recently developed by the same agency (see March-April 1949 issue of the MEDICAL BULLETIN), the stereoscope weighs only 61½ pounds.

An important feature of the new stereoscope is that it employs two single illuminators which are standard items of medical issue for the Army, Navy, and Air Force. The illuminators can be used for reading flat and stereoscopic films (fig. 1).



—U. S. Army Photograph

Figure 2.—The stereoscope fits compactly into a die-drawn aluminum chest. Total weight of apparatus and chest is 117 pounds.

¹ From the Public Information Office, Army-Navy Medical Procurement Office, Brooklyn, N. Y.

In addition to the stereoscope's lack of weight and bulk, the optical section, containing mirrors and adjusting mechanism, is sealed against moisture and dust to insure its efficiency under field conditions. Masking shutters are provided for the viewing of small films and the optical adjustment is easily accomplished by a single control knob.

The entire apparatus fits into a single, die-drawn aluminum chest which is watertight and extremely durable (fig. 2). Packed, its gross weight is only 117 pounds. Designed for carrying for two persons, it is presently undergoing operational tests.

THE PHYSICIAN MUST KNOW
WHAT HIS PREDECESSORS HAVE
KNOWN IF HE DOES NOT WISH TO
DECEIVE BOTH HIMSELF AND
OTHERS.—*Hippocrates*.

EDITORIALS



Anthropometry

Every person is endowed by his parents with certain anatomic, physiologic, immunologic, and psychologic material which predetermine the course of his health and his physical and psychologic reactions to environment. Sheldon, Stevens, and Tucker,¹ by means of standardized side, front, and back photographic views of persons, devised a classification of somatotypes based on three body types: (a) Endomorphy; the person with a soft, round, large body, a large protuberant abdomen, and a small thorax, in whom the endodermal elements are fully developed. (b) Mesomorphy; the muscular, broad-chested, strong person with thick well-developed bones and muscles of the arms and legs. (c) Ectomorphy; the poorly developed, long, thin person, with receding chin and forehead, thin face, and narrow chest. Further classifications into distinct morphological groups are obtained by direct measurements from the photograph.

The Navy offers a fertile field for the student interested in anthropometry. A thorough and careful study of somatotypes may bring out factors of great importance in the selection of personnel best fitted for duty in various branches of the armed forces.

Inquisitiveness and a desire to understand natural phenomena are the factors underlying the basis for many scientific achievements; and research is the studious inquiry or examination, which has as its aim the discovery of facts and their correct interpretation.

¹ SHELDON, W. H.; STEVENS, S. S.; and TUCKER, W. B.: *The Varieties of Human Physique: An Introduction to Constitutional Psychology*. Harper & Brothers, New York, N. Y., 1940.

Naval medical officers have an unlimited opportunity for such research. A study of somatotypes and appropriate follow-up with relation to the incidence of disease or behavior patterns may be of far reaching interest and value. To carry on such investigation requires only an interest and enthusiasm in the subject, a penchant for work, and a few items of equipment.



Panacea

Drugs alone do not cure. The treatment of disease must include a consideration of the patient's anxiety as well as the extent to which an ailment should be permitted to interfere with his normal life and activity; this should be so directed that it approaches the normal as nearly as possible. A patient should not be so impressed with the importance of the disease that he lives for it alone—otherwise the therapeutic measures, while they may prolong his life, will destroy his soul.

Jean Jacques Rousseau once wrote "Medicine is all the fashion in these days, and very naturally. It is the amusement of the idle and unemployed, who do not know what to do with their time in taking care of themselves. If by ill-luck they had happened to be born immortal, they would have been the most miserable of men; a life they could not lose would be of no value to them. Such men must have doctors to threaten and flatter them, to give them the only pleasure they can enjoy, the pleasure of not being dead."



Gynecology and Obstetrics in a Naval Hospital

Graduate training in the Navy, in certain specialties, and through a limited number of graduate courses and fellowships in civilian institutions, has been in effect since 1920 when Rear Adm. E. R. Stitt (MC) U. S. N. added basic science courses to the curriculum of the Naval Medical School. (The Naval Medical School was established

in 1902.) In 1944 a formal residency program in clinical specialties based on American Boards' standards was activated in naval hospitals by Dr. Paul Titus, Secretary of the American Board of Obstetrics and Gynecology and then President of the Advisory Board for Medical Specialties during the wartime period and soon after he reported for active duty as a Reserve officer in the Bureau of Medicine and Surgery. Dr. J. Roscoe Miller, now President of Northwestern University, and Dr. E. H. Cushing, now Chief of Training Division, Medical Bureau of the Veterans' Administration, and then a Reserve officer attached to the Professional Division of the Bureau of Medicine and Surgery collaborated and participated in this program and its early development. Both Dr. Alphonse McMahon of the St. Louis University School of Medicine, then Commodore (MC) U. S. N. R., and Dr. Winchell McK. Craig of the Mayo Clinic, Rochester, Minn., then Rear Admiral (MC) U. S. N. R., had a share in carrying on the Training Program subsequently.

The purpose of this training was to utilize the broad clinical facilities and material in naval hospitals for specialty training of medical officers. Emphasis was placed upon affiliation with the American Medical Association's Council on Education and Hospitals, the American College of Physicians and Surgeons, and the American Boards so that the medical officers of the Reserve Corps or of the Regular Navy assigned to such training might receive credits from these groups for the graduate training obtained. This training program has since been greatly extended and advanced under the able direction of Capt. Lloyd R. Newhouser (MC) U. S. N.

OB RESIDENCY¹

The Dependents' Service is in a modern three-story building with complete facilities for outpatient and inpatient care in gynecology, obstetrics, and pediatrics. The total number of outpatient visits from 1 January 1946 to 1 November 1948 was 38,523 (medical Gyn visits, 11,890; obstetrical visits, 15,505; and gynecological visits, 11,128).

The Chief of Service is certified by the American Board of Obstetrics and Gynecology and is a Fellow of the American College of Surgeons. He is also associate professor in obstetrics and gynecology at Northwestern University Medical School.

The consultants in obstetrics and gynecology, Dr. George Gardner, professor of obstetrics and gynecology and Dr. John Huffman, assistant professor of obstetrics and gynecology, Northwestern University School of Medicine, are called upon for consultation and opinion in the management of unusual obstetrical cases.

¹ U. S. Naval Hospital, Great Lakes, Ill.

When complications occur consultations are held with the chief of Dependents' Service. Special emphasis is placed upon the prevention of complications. An "abnormality" clinic for the management of obstetrical complications is held weekly. All patients are individually followed from their initial visit through delivery and postpartum course by the same resident; he remains responsible for the diagnosis, management, and treatment of the case under the supervision of the Chief of Service.

The Thom technique of x-ray pelvimetry is routine for all primiparas and anticipated dystocia; the films are interpreted by the resident physician under the supervision of the chief of x-ray department.

The pathologic conditions encountered in obstetrics are comparable to those seen on any similar service. Deliveries from 1 January 1946 to 1 November 1948 are tabulated in table 1.

TABLE I

	<i>Number of cases</i>
1. Full term deliveries.....	1,378
2. Premature deliveries.....	32
3. Methods of delivery:	
Spontaneous.....	606
Low forceps.....	651
Mid forceps.....	22
High forceps.....	0
Breech spontaneous.....	3
Breech extraction.....	42
Version.....	1
Version and extraction.....	5
Caesarean section.....	37
4. Multiple pregnancy deliveries.....	10

The indications for the 37 caesarean sections are tabulated in table 2. There were no deaths in this series.

TABLE 2

	<i>Number of cases</i>
Indication for caesarean:	
Cephalopelvic disproportion.....	9
Preeclampsia.....	6
Previous section.....	10
Pulmonary disease.....	1
Abruptio placentae.....	3
Cardiac decompensation.....	1
Myesthenia gravis.....	1
Large cervical fibroid.....	2
Coxa vera.....	1
Vaginitis and cervicitis.....	1
Elderly multipara (last child 26 years old).....	1

GYN RESIDENCY¹

In the gynecology clinic the resident assumes responsibilities in diagnosis and treatment similar to those in the obstetrical clinic. A large variety of cases in all age groups are seen. Special emphasis is placed upon careful individual evaluation and use of all facilities for differential diagnosis.

Medical Gynecology

From 1 January 1946 to 1 October 1948 there were 1,310 admissions. The varied problems encountered in diagnosis, management, and treatment of these cases give the resident broad experience in gynecology as well as in related clinical fields.

Surgical and Operative Gynecology

From 1 January 1946 to 1 October 1948 there were 1,370 admissions. The resident does a complete physical examination and makes a working diagnosis and performs or directs the laboratory studies and treatment, under the guidance of the Chief of Service. Routine pre-operative laboratory work consists of complete hematological studies, urinalysis, stool examination, chest x-ray, KUB or barium enema x-ray, and electrocardiograms. Whenever indicated, special studies are done. Other departments are frequently called upon for consultation.

Four hundred and thirty-one gynecological operations (170 major and 261 minor) were performed during the period 1 January 1946 to 1 November 1948. They are tabulated in table 3.

TABLE 3

	<i>Number of cases</i>
A. Abdominal surgery:	
Ovary.....	52
Fallopian tube.....	52
Uterus.....	72
Miscellaneous—Concurrent appendectomy.....	47
Appendectomy—Acute appendicitis during pregnancy.....	39
Pelvic and abdominal adhesiotomy.....	11
Bowel resection and hysterectomy.....	1
B. Vaginal surgery:	
Major:	
Total hysterectomy.....	9
Minor:	
Dilatation and curettage (diagnostic).....	65
Dilatation and curettage (for incomplete abortions).....	75
Conization or amputation of cervix.....	8
Cervical repair.....	28
Vagina:	
Vaginal plastic repair.....	59
Vulva plastic repair, etc.....	26

TABLE 3—Continued

		Number of cases
C. Breast:		
Excision of benign tumor.....		25
Amputation.....		1
Number of deaths.....		0

All residents study the pathological specimens, grossly and microscopically, with the pathologist.

A summary of the resident's daily schedule is given below :

0800-0900	Conference and discussion of problem cases with Chief of Service.
0900-1000	Ward rounds.
1000-1200	Gynecological surgery (2 days weekly) or Gynecology Clinic and Postnatal clinic (3 days weekly). Formal ward rounds with Chief of Service (1 day weekly).
1300-1400	General Hospital Staff Clinical Conference (1 day weekly).
1300-1600	Antenatal Clinic (4 days weekly).
1600-1730	OB-GYN Staff Clinical Conference (1 day weekly).
	Microscopic Pathology (1 day weekly).
	X-ray Pelvimetry Reading (1 day weekly).

In addition to general surgery, internal medicine, urology, proctology, dermatology, neuropsychiatry, and orthopedic consultations on gynecological or obstetrical patients are attended by the resident whenever indicated. Once each month an entire day is spent at the Chicago Gynecological Society clinics. This schedule is closely adhered to with provision for emergency surgery, deliveries, and admission of new patients.

All autopsies, especially those on females, are attended by the resident staff. Anatomical study of the abdominal and pelvic viscera is done whenever possible.

A summary of the training received and the work performed by the author during a 2-year residency is outlined in table 4.

TABLE 4

A. Obstetrics:

Total prenatal visits personally cared for.....	5,046
Obstetrical hospital cases worked up and followed.....	339
For delivery.....	405
Deliveries observed.....	166
Deliveries performed.....	344
Spontaneous.....	152
Low forceps.....	155
Mid forceps.....	7
Breech.....	14
Twins.....	5
Cesarean.....	11
Internal version and extraction.....	1

TABLE 4—Continued

A. Obstetrics—Continued	
Deliveries assisted.....	66
Spontaneous.....	23
Low forceps.....	25
Breech.....	5
Cesarean.....	17
Version and extraction.....	2
Obstetrical anesthetics given.....	129
X-ray pelvimetry films read.....	720
B. Gynecology:	
Total Gynecology out-patient visits.....	4,499
Cervical and endometrial specimens taken for biopsy.....	91
Rubin tests performed.....	53
Infertility cases completely investigated.....	30
Vaginal pessaries fitted.....	150
Uterosalphingrography.....	6
Cystoscopic examinations.....	38
Proctosigmoidoscopic examinations.....	24
Total Gynecology hospital cases worked up and followed.....	578
C. Surgery:	
Major surgical operations observed.....	92
Major surgical operations assisted.....	92
Major surgical operations performed.....	121
Surgical anesthetics administered.....	51
D. Pathology:	
Autopsies attended.....	36
Gross and microscopic specimens studied.....	310
Attended 2 courses in Obstetrics and Gynecology at Northwestern University Medical School (40 hours total) under Dr. George Gardner.	
E. Conferences:	
Attended 1 hour daily clinical conferences. Conducted weekly dependents' Staff Clinical Conference. Attended weekly hospital staff conference. Prepared and presented major topics at 27 Dependents' Staff Clinical Conferences. Participated in 64 Journal Club meetings. Attended Chicago Gynecology and Obstetrics Society Operative Clinics and Lectures (total 56 hours). Attended other national and municipal medical society lectures pertaining to Gynecology and Obstetrics (total 14 hours).	
F. Basic sciences:	
1. Anatomy—Complete dissections of the abdomen and pelvis when possible.	
2. Biochemistry—Frequent clinical investigations in cases of acidosis, alkalosis, nutritional deficiencies, nephritis, toxemia, etc.	
3. Bacteriology and Parasitology—Cultures and smears utilized often in clinical studies.	
4. Physiology and Pathological Physiology—Frequent clinical studies in hematology, serology, urinalyses, stool analyses, gastric analyses, and basal metabolic rates.	
5. Histology and Cytology—Constantly reviewed during study of histopathological specimens.	

G. Instruction and Investigation:

Active participation in the instruction of interns and junior residents was undertaken in the clinic, laboratory, wards, operating and delivery rooms. Audiovisual aids were frequently used. Some investigative work was performed in infertility studies, trichomonas, vaginalis infections, use of penicillin in obstetrics, and clinical photography.

The main experiences and training which cannot be interpreted by statistics are concerned with the manner in which this specialty training is supervised and practiced. Especially worth emphasizing is the management of each patient as an individual—not as just another case or diagnosis. Always of primary concern is the physical and mental comfort and welfare of each patient. Consultations with the other services of the hospital have been stressed and are frequent.

CONCLUSIONS

Sufficient clinical material and adequate facilities are available in a large naval hospital with Dependents' Service to support an active residency training program in obstetrics and gynecology. The quality of this training is comparable to that in any other well-organized institution.

—*Merrill W. Rusher, Lieutenant (MC) U. S. N.*

OFFICERS OF THE MEDICAL DEPARTMENT

*Whose Deaths Have Been Reported Since
the Last Issue of the Bulletin*

BELL, BENJAMIN PARKS, Lieutenant (MC) U. S. N. R.
(Inactive). Died 5 September 1948 at Oklahoma City,
Okla.

CASTO, DOW HOLMES, Lieutenant Commander (MC)
U. S. N. (Retired, Inactive). Died 22 May 1949 at
U. S. Naval Hospital, Mare Island, Calif.

CRANDALL, JOHN WILLIAM, Commander (DC) U. S. N.
(Retired, Inactive). Died 9 March 1949 at St. Joseph
Hospital, Flint, Michigan.

DOCKRY, LYMAN, EDWIN, Captain (MC) U. S. N. R. (Re-
tired, Inactive). Died 19 May 1949 at U. S. Naval
Hospital, San Diego, Calif.

HODGE, IDA LEWELLYN, Lieutenant, junior grade (NC)
U. S. N. (Retired, Inactive). Died 23 April 1949 at
U. S. Naval Hospital, Bethesda, Md.

HUBBARD, JOHN DANES, Lieutenant Commander (MC)
U. S. N. R. (Retired, Inactive). Died 9 December 1948
at Roger Williams General Hospital, Providence, R. I.

MCINTYRE, KENITH SMITH, Commander (MC) U. S. N. R.
(Retired, Inactive). Died 20 February 1949 at Hast-
ings, Mich.

ROYER, HOWARD, Lieutenant Commander (MC) U. S. N. R.
(Inactive). Died 15 October 1948 at Grand Island,
Neb.

SMITH, RUSSELL FRANK, Commander (DC) U. S. N. R.
(Retired, Inactive). Died 1 January 1949 at Ponca City,
Okla.

BOOK REVIEWS AND BOOKS RECEIVED



Publishers submitting books for review are requested to address them as follows:

The Editor,

UNITED STATES NAVAL MEDICAL BULLETIN,

Bureau of Medicine and Surgery, Navy Department,
Washington 25, D. C.

(For review)

NOTES: Books marked by symbol ① or ② meet the library requirements for personnel training and are recommended by the Advisory Board, Bureau of Medicine and Surgery.

Symbol ① indicates that the book is recommended for naval hospitals; and symbol ② for dispensaries, dependents service, and medical departments of ships.

BRITISH SURGICAL PRACTICE under the general editorship of Sir Ernest Rock Carling.

- ① F. R. C. S., F. R. C. P., *Consulting Surgeon, Westminster Hospital*, and J. Paterson Ross, M. S., F. R. C. S., *Surgeon and Director of Surgical Clinical Unit, St. Bartholomew's Hospital, Professor of Surgery, University of London*. In eight volumes. Volume 1, 486 pages, 228 illustrations and 3 plates. Volume 2, 540 pages, 318 illustrations and 4 plates. Volume 3, 524 pages, 287 illustrations and 4 plates. Volume 4, 486 pages with 261 illustrations and 2 plates. Volume 5, 494 pages, 220 illustrations and 6 plates. Butterworth & Co., Eng., The C. V. Mosby Company, St. Louis, Mo., publishers, 1948. Price, \$15.00 each.

An encyclopedia of surgical treatment in 8 volumes. This is a concise, and practical presentation of standard accepted methods and procedures in surgery. The foremost surgeons in Great Britain are represented among the 2 editors, 21 consulting editors, and 10 associate editors of special subjects.

Volume I deals with 44 topics relating to various surgical conditions in alphabetical order from Abdominal Emergencies to Autonomic Nervous System; volume II considers 38 topics from Backache to Bursae; volume III considers 63 topics from Caesarean Section to Eyelid; volume IV considers 36 topics from Facial Palsy to Hiccup; volume V considers 39 topics from Hodgkin's Disease to Lymphogranuloma Inguinale.

The various subjects are presented by experts in the particular fields, in such a manner as to bring out the salient feature in diagnosis and treatment.

One cannot expect complete coverage of every subject in a work of this nature: the element of time plays a factor in this since, except for a brief statement regarding penicillin and the comment that the "merits of the agent have yet to be assessed," the antibiotics are not discussed.

The volumes are well illustrated, the style and format is excellent, the bibliography is ample and an index is included in each volume.

This is an excellent quick reference for the busy general practitioner and a valuable addition to his diagnostic and therapeutic armamentarium.

- PREOPERATIVE AND POSTOPERATIVE CARE OF SURGICAL PATIENTS**, by Hugh C. Ilgenfritz,
 ① A. B., M. D., F. A. C. S., *Formerly Assistant Professor of Surgery, Louisiana State University School of Medicine, and Visiting Surgeon, Charity Hospital of Louisiana at New Orleans.* Foreword by Urban Maes, M. D., D. Sc., F. A. C. S., *Emeritus Professor of Surgery, Louisiana State University School of Medicine; Consulting Surgeon, Charity Hospital of Louisiana at New Orleans; Consulting Surgeon, Touro Infirmary; Consulting Surgeon, Veterans' Administration Hospital, New Orleans.* 898 pages, illustrated. The C. V. Mosby Company, St. Louis, Mo., publishers, 1948. Price \$10.

This book represents an excellent delineation of almost all phases of pre-operative and post-operative care.

The material is presented in an easy-to-read manner, yet detail and scope of information have not been sacrificed to oversimplicity.

A fine section on fluid and electrolyte balance is included, as well as basic concepts of protein metabolism and nitrogen balance.

Future editions of the book would be benefited by the addition of charts and diagrams and it is felt that nothing is gained by many of the illustrations such as those showing the adjustment of an intravenous flow and assembling of blood collecting set.

This book is remarkable in that unlike most books of its type, the material is still current and not yet outdated by new advances. This book or one of its type should be in the library of every naval activity where surgery is likely to be performed.—*Lt. (jg.) C. E. Rogers (MC), U. S. N.*

- THE FOOT AND ANKLE, Their Injuries, Diseases, Deformities and Disabilities**, by Philip
 ① Lewin, M. D., F. A. C. S., *Associate Professor of Bone and Joint Surgery, and Acting Head of Department, Northwestern University Medical School; Professor of Orthopaedic Surgery, Post-Graduate Medical School of Cook County Hospital; Attending Orthopaedic Surgeon, Cook County Hospital; Senior Attending Orthopaedic Surgeon, Michael Reese Hospital, Consulting Orthopaedic Surgeon, Municipal Contagious Disease Hospital, Chicago; Army of United States.* 3d edition, thoroughly revised. 847 pages; 389 illustrations. Lea & Febiger, Philadelphia, Pa., publishers, 1947. Price \$11.

Doctor Lewin's book is a complete revision of the first and second editions. The author's war experiences and the new advances in etiology, chemotherapy, and surgical techniques are represented in a new section. The book is freely illustrated, many of the drawings being reproduced from recent literature, representing the more recent works presented by various authors.

It is encyclopedic in its coverage of the diseases of the foot and ankle and is probably the best in a field in which authoritative works are few. It is, indeed, "encyclopedic in scope," as stated by the publisher's advertisement, but it is felt that it is perhaps too much so. In the descriptions of the treatment of hallux valgus, for instance, or for congenital talipes equinovarus, many procedures are mentioned, including several that have long been in disuse. No treatment is described in exact detail, and the author does not state which treatment he finds best nor which he recommends.

This fault of presenting many opinions without qualifying each or recommending any is found throughout the book. The book is an excellent source book for the trained orthopedist or surgeon interested in the foot and ankle, but is of little value to the student or general practitioner. The orthopedist referring to a specific therapeutic procedure will, in all likelihood, find it, but the less trained physician will probably be baffled by the mass of facts and illustrations. As in the description of flat feet many methods of therapy are given, but the evaluation of each procedure is missing and there is no indication of choice of procedure.

The bibliography is extensive and valuable for the reader wishing to review original articles on these subjects and to expand his knowledge of the pedal extremity. The book is the best in a field of controversial issues and much latitude.—*Lt. A. B. Dickson (MC), U. S. N.*

CLINICAL ASPECTS AND TREATMENT OF SURGICAL INFECTIONS, by Frank Lamont Meleney, M. D., F. A. C. S., Associate Professor of Clinical Surgery, College of Physicians and Surgeons, Columbia University; Associate Visiting Surgeon, Presbyterian Hospital, New York City. With a Foreword by Allen O. Whipple, M. D. 840 pages, illustrated. W. B. Saunders Company, Philadelphia, Pa., publishers, 1949. Price \$12.

Dr. Meleney, a pioneer in the field of surgical bacteriology, presents the clinical aspects, bacteriology, and treatment of necrotizing and pyogenic infection in a concise, masterful, and instructive manner. Numerous illustrative case reports illuminate the salient points in diagnosis and treatment.

Infections involving practically every organ and structure of the body are considered by systems; the pathogenesis, etiology, diagnosis, and treatment of each condition is discussed in a concise manner. Bacitracin, sulfonamides, penicillin, streptomycin, and parachlorophenol are considered.

The chapter on "Physiological Considerations in Surgical Infections" is written by John S. Lockwood, M. D.; that on "Surgical Infections of the Peritoneum" is written by Harold D. Harvey, M. D.; and that on "Surgical Infections in War Wounds" is written by Alfred B. Longacre, M. D., and William R. Sandusky, M. D.

The index refers not only to the subject and authors but also to bacteriologic factors and bibliographic reference. The bibliography is complete and recent.

This book contains a wealth of valuable information for every physician, the surgeon, regardless of specialty, as well as to the general practitioner, resident, and intern.

FRACTURES AND DISLOCATIONS, by Edwin O. Geckeler, M. D., Fellow of the American College of Surgeons, Fellow of the American Academy of Orthopaedic Surgeons, Fellow of the American Association for the Surgery of Trauma, and Diplomate of the American Board of Orthopaedic Surgery. 4th edition, 371 pages, illustrated. The Williams & Wilkins Company, Baltimore, Md., publishers, 1948. Price \$5.

This book is intended to be a ready reference for the general practitioner and student for the treatment of fractures and dislocations. As such, it is of value to the naval medical officer aboard ship and at small stations who only treats fractures and dislocations occasionally, yet is charged with the crucial task of treating all types of fractures and dislocations correctly in the first and most critical stage of the injury. Basic principles and terms are clearly and simply presented in an easy reference format. There is no attempt by the author to make this manual a complete textbook of fractures and dislocations, but the one method of treating each type of fracture and dislocation, which has proved its value to the author, is presented. Each chapter, however, is accompanied by an extensive bibliography for those who wish to pursue the topic in greater detail.

An excellent, yet brief, section is included on the reporting and recording of fracture cases and the medicolegal aspects which are becoming more and more a part of the practice of naval medicine.

—*Commander J. S. Thiemeyer (MC), U. S. N.*

TREATISE ON SURGICAL INFECTIONS, by Frank Lamont Meleney, M. D., Associate Professor of Clinical Surgery, College of Physicians and Surgeons, Columbia University, Associate Visiting Surgeon, Presbyterian Hospital, New York. 713 pages; illustrated. Oxford University Press, New York, N. Y., publishers, 1948. Price \$12.

Some years ago Dr. Hans Zinsser gave an informal course in the bacteriology of surgical infections to a group of six surgeons from the Presbyterian Hospital.

The youngest of these was Frank L. Meleney, then an instructor. Since that time, Dr. Meleney has seriously and intensively studied surgical bacteriology, the results of which are culminated in this excellent publication. This volume includes the usual discussions of history, classifications, sterile technique, sterilization, and methods for bacterial cultivation. In addition, excellent discussions of the various pathological processes occurring in various types of wounds, as well as the use of the newer chemotherapeutic and antibiotic drugs are closely correlated with his personal experiences in the field of surgical bacteriology over a period of more than thirty years. The chapter on "The Bacteria that Produce Surgical Infectious Diseases" is written by Balbina A. Johnson, B. A. This book is undoubtedly one of the best of its kind, and is an essential to both the surgeon dealing with infections and the pathologist and bacteriologist working in the laboratory.—*Lt. B. H. Smith, Jr. (MC), U. S. N.*

THE RADIOLOGY OF BONES AND JOINTS, by James F. Brailsford, M. D., Ph. D., F. R. C. P.,

- ① F. I. C. S., Hunterian Professor, Royal College of Surgeons, England, 1934-5, 1943-4;
- ② Founder and First President of the British Association of Radiologists (now the Faculty of Radiologists); Director of Radiological Studies in Living Anatomy, The University of Birmingham; Honorary Radiologist to the Queen Elizabeth Hospital, Birmingham, The Royal Cripples' Hospital, and the Warwickshire Orthopaedic Hospital; Radiologist to St. Chad's Hospital, The City of Birmingham Infant Welfare Centres and the Military Hospital, Hollymoor, Birmingham; Consulting Radiologist to the City of Birmingham Hospitals, The Robert Jones and Agnes Hunt Orthopaedic Hospital, The Birmingham Accident Hospital and Rehabilitation Centre, The Birmingham Mental Hospital; Late Radiologist, The Birmingham War Hospitals and Ministry of Pensions Hospitals. Awarded The Robert Jones Gold Medal and Prize of The British Orthopaedic Association, 1937. The Roentgen Prize, 1936. 4th edition. 760 pages, 615 illustrations. The Williams & Wilkins Company, Baltimore, Md., publishers, 1948. Price \$12.

The first edition of this monograph appeared in 1934 and since that time its effectiveness as a text and as a reference work have necessitated frequent reprintings and three additional revisions. This, the fourth edition, has been considerably revised over the previous editions with the inclusion of over 200 additional illustrative radiographs. These changes were necessitated by the rapid accumulation of additional facts in the literature of medical science. Dr. Brailsford attempts in this, as in each of his revisions, to bring his source book into line with current thought and to present, often by serial photographs, the radiographic appearance of the normal bones and joints and departures therefrom.

As the author states most of these accepted and proved changes have appeared in the periodical literature but have not yet filtered down into general medical knowledge. He attempts in this volume to present a concise and authoritative all-embodying material of his own and of numerous colleagues. He succeeds. The 14 double columned pages of bibliography alone are invaluable to the research student.

The volume is divided into two parts. Part 1, "Regional Radiography," begins with the details of radiographic character in the skeletal regions; hand and wrist, spine, thorax, skull, hip joint and pelvis, to name a few, to end in a chapter on dental radiography. Each chapter is in itself a short monograph. Normal appearances are described and illustrated, the more common and obscure abnormalities compared, and differential diagnostic points emphasized.

In the second part of the book correlation of the whole is pursued in a general discussion of abnormalities and pathology of bones and joints. In this section there appears material on developmental abnormalities, dystrophies, generalized diseases of the skeleton, and bone tumors, including that "bete noir" of every student, the granulomata of bone.

The section on bone tumors is clear and adequate. One may find some points of disagreement with the nosology employed and yet, as the author puts it, his classification is broad enough for a meeting place for roentgenologist, pathologist, and orthopedic surgeon. His summary of evidence on bone tumors on page 719 is well stated. The clinician may not agree wholeheartedly with the authors' enthusiasm and entire reliance on roentgen diagnosis as opposed to biopsy in obscure bone lesions, nor is it entirely proved that radiation is the best treatment for the ostea-clastomatol, in fact, there is now some evidence that malignant changes may be enhanced by the radiation of benign giant cell tumors of bone.

In a work of this character and authority, it is perhaps superfluous to add that this volume will be valued by all who work with bones and joints; orthopedist, roentgenologist, medical referee, and diagnostician.

The student of roentgenology or orthopedic surgery will find it one of his most useful handbooks.—*Commander C. R. Carr (MC), U. S. N.*

ZINSSER'S TEXTBOOK OF BACTERIOLOGY, The Application of Bacteriology and Immunology

- ① to the Diagnosis, Specific Therapy and Prevention of Infectious Diseases for
- ② Students and Practitioners of Medicine and Public Health, revised by: David T. Smith, M. D., *Professor of Bacteriology and Associate Professor of Medicine, Duke University School of Medicine*; Donald S. Martin, M. D., M. P. H., *Professor of Preventive Medicine and Public Health and Associate Professor of Bacteriology, Duke University School of Medicine*; Norman F. Conant, Ph. D., *Professor of Mycology and Associate Professor of Bacteriology, Duke University School of Medicine*; Grant Taylor M. D., *Associate Professor of Bacteriology and Associate Professor of Pediatrics, Duke University School of Medicine*; Henry I. Kohn, Ph. D., M. D. Surgeon, U. S. P. H. S., *Assistant Professor of Physiology and Pharmacology (on leave), Duke University School of Medicine*; and Mary A. Poston, M. A. *Instructor in Bacteriology, Duke University School of Medicine*. 9th edition. 992 pages, illustrated. Appleton-Century-Crofts, Inc., New York, N. Y., publishers. 1948. Price \$10.

This book is presented as a basic approach to the biological characteristics of the organisms as well as to the reactions of the living tissues to the bacteria and their products. The authors point out that illustrations have been used from the field of agricultural and sanitary bacteriology to reveal a proper understanding of processes of bacterial nutrition and physiology and for breadth of view in considering problems of the relation of bacteria to our food supply and environment. The discussion of the sulfonamides has been expanded and a section on antibiotics added in this edition. A new chapter on pleuropneumonia-like organisms has been added.

Although practitioners of medicine can garner items of value and interest from this book; it is felt that there are many more worthy and briefer textbooks and articles that may be selected from the huge amount of medical literature being printed today. The textbook is cumbersome, tedious, and is tiresome reading. It is not recommended for the interne, resident, or practitioner of medicine.

It is felt that the textbook is not particularly suitable or desirable for medical students or beginning students in Bacteriology.

—*Commander R. L. Fruin (MC), U. S. N.*

MANUAL OF UROLOGY, by R. M. LeComte, M. D., F. A. C. S., *formerly Professor of Urology,*

- ① *Georgetown University, Medical Department; Member of the American Urological Association*. 4th edition. 311 pages, illustrated. The Williams & Wilkins Company, Baltimore, Md., publishers, 1948. Price \$4.

This is a well-illustrated, thoroughly revised edition of a valuable publication written by a distinguished American urologist. It is brief, accurate and extremely readable but completely covers the field of urology. It is especially well-adapted for students and general practitioners.

The book is arranged in eleven chapters, each dealing with a large, well-covered subject. Particularly excellent are the sections devoted to the fundamentals of history taking, physical and laboratory examinations. The sections on anatomical and physiologic reviews of the genito-urinary systems are likewise outstanding. In the chapter devoted to symptomatology, the section on Pain and Associated Reactions is particularly complete, lucid, and well-illustrated. A carefully written résumé of the autonomic nervous system, the theories of visceral pain, and the pain mechanism in the various genito-urinary organs is especially noteworthy. Diagrammatic figures have been selected from various modern textbooks to illustrate this section; their inclusion has done much to render this difficult subject readily understandable.

The section on General Medication is concise, clear, and completely up-to-date. The mode of action, applicability, and inherent dangers attending the employment of each type of drug, antibiotic, or chemotherapeutic agent are adequately described.

The choice of outline drawings, made from skiagrams, to demonstrate characteristic urographic deformities and filling defects is indeed fortunate. By this means, the student may more readily recognize the typical abnormality from the actual reproduction of the skiagram itself. A sufficient number of these drawings have been included to illustrate adequately the common abnormal conditions, demonstrable by urographic methods.

An excellent summary of the modern concept of the various genito-urinary diseases by systems is offered. Etiology, pathology, and diagnosis are stressed and an excellent discussion of modern treatment is given with a wise omission of detailed descriptions of operative procedures. Minor manipulations as employed in the routine work of the physician doing urology in a general practice are, however, amply described.

Particularly noteworthy are the sections on the control of calculus formation, functional disturbances of the male sexual system, neurogenic and functional diseases of the urinary bladder, and chemotherapy.

The author has followed the more modern method of listing references by chapter at the end of the book; footnotes are thereby eliminated.

This small, compact, thoroughly up-to-date volume should be a valuable addition to the library of every medical officer who is interested in urology.

—Commander S. Johnson (MC), U. S. N.

PERIPHERAL VASCULAR DISEASES, Diagnosis and Treatment, by David W. Kramer, M. D., F. A. C. P., Associate Professor of Medicine, Jefferson Medical College; Assistant Physician, Jefferson Hospital; Chief Clinical Assistant, Vascular Clinic, Jefferson Hospital; Visiting Physician, Medical Division, Philadelphia General Hospital; Consultant on Peripheral Vascular Disorders, Philadelphia General Hospital; Attending Physician, Metabolic Division, and Chief of Diabetic Clinic, Jewish Hospital; Attending Physician and in Charge of Department of Metabolic and Peripheral Vascular Disorders, St. Luke's and Children's Medical Center; Metabolist to Eagleville Sanatorium. Foreword by Edward L. Bortz, M. D. 620 pages, with 157 illustrations, 25 in color. F. A. Davis Company, Philadelphia, Pa., publishers, 1948. Price, \$8.

In the progress of medicine we have lengthened the lives of our patients to the point where peripheral vascular disease is frequently the problem of the practicing physician. Dr. Kramer presents a well-organized, readable book which reflects his vast clinical experience. The division of the book into five basic parts consisting of symptoms, signs and tests, followed by occlusive vascular disorders; the vasospastic and vasodilatory groups; gangrene, chronic leg ulcers; and lastly, disturbances of the veins and lymphatic tissues with an over-all discussion of treatment. An excellent bibliography follows each of the five parts.

The absence of the Collins Oscillometer and the discussion of diagnostic instruments is noted. The too frequent use of tables of comparative oscillometric readings and diagrams of histamine tests and many illustrations which are almost pointless add to the bulk of the volume and are of questionable value.

This book is recommended for medical students, interns, and residents. It is recommended for all medical libraries.—*Lt. W. H. Bosicell (MC), U. S. N.*

- VIRUS DISEASES OF MAN, by C. E. VAN ROOYEN, M. D., D. Sc., (Edin.), M. R. C. P. (Lond.).
 ① *Research Member and Professor of Virus Infections, Connaught Medical Research Laboratories and School of Hygiene, University of Toronto, Formerly Sir Hallett Stewart Research Fellow, and Lecturer in Bacteriology, University of Edinburgh;* and A. J. Rhodes, M. D., F. R. C. P., (Edin.), *Research Associate and Associate Professor of Virus Infections, Connaught Medical Research Laboratories and School of Hygiene, University of Toronto, Consultant in Virus Infections, Hospital for Sick Children, Toronto; formerly Lecturer in Bacteriology, University of Edinburgh, and London School of Hygiene and Tropical Medicine, University of London.* 1,202 pages, illustrated. Thomas Nelson & Sons, New York, N. Y., publishers, 1948. Price \$22.50.

This is the second edition of a work which made its first appearance in 1940. The book is intended for use as a reference volume for laboratory workers and clinicians interested in the field of human and animal virus infections. It does not include Rickettsial infections of man, virus diseases of animals not known to be transmissible to man, plants and insects nor does it include viruses responsible for tumor formation.

The first edition of this book grouped the various diseases according to the system involved. This edition is divided into 12 sections, namely: Diseases of the Skin and Mucous Membranes; Infective Fevers; Tropical Infections; Common Cold and Influenza; Infections of the Eye; Pneumonitis-*Psittacosis*-LGI group; Rabies and Pseudorabies; Poliomyelitis Group; Virus Meningitis; Diseases Characterized Chiefly by Encephalitis, Encephalomyelitis, or Myelitis; and Infective Hepatitis and Serum Jaundice. These peculiar mixed divisions are confusing and involve considerable repetition.

This work is as strong from the laboratory viewpoint as it is weak from the clinical viewpoint.

Laboratory methods are described in minute detail but the clinical picture is passed over very rapidly and is of little value to the clinician.

In reviewing the laboratory procedures one is impressed by the lack of figures, only 43 in a book that describes over a thousand techniques. The addition of color plates could have made this a valuable laboratory manual and reference book.

There are 9,540 references in this book. The mere inclusion of such a wealth of material must have involved an enormous amount of work to evaluate these references before inclusion and to work them into the necessarily chopped up text as a result of them.

The book is poorly bound, no head band or tapes, on medium grade white gloss paper. For a laboratory manual that will receive hard usage, a much better binding should have been provided.

This book will prove of interest to those engaged in virus laboratory work and those desirous of an exhaustive bibliography on this subject.

—*Commander E. E. Metcalfe (MC), U. S. N.*

- A HANDBOOK FOR THE DIAGNOSIS OF CANCER OF THE UTERUS BY THE USE OF VAGINAL SMEARS, by Shields Warren, M. D.; *Assistant Professor of Pathology, Harvard Medical School; Pathologist, New England Deaconess and New England Baptist Hospitals; Reserve Consultant in Pathology to the Bureau of Medicine and Surgery, U. S. Navy; Captain (MC) USNR;* and Olive Gates, M. D.; *Pathologist, Massachusetts State Tumor Diagnosis Service; Assistant Pathologist, Pondville Hospital (Massachusetts Department of Public Health).* 182 pages, 50 plates. Harvard University Press, Cambridge, Mass., publishers, 1947. Price \$4.

This looseleaf type handbook has been prepared, as the authors state, for use as a laboratory guide. It has been written from the standpoint of both the practicing pathologist and the technician whom he must train. The purpose of this publication is mainly to stimulate interest in the vaginal smear and its application to cancer diagnosis and present briefly the difficulties of the method and the deficiencies in present knowledge.

The handbook opens with a foreword by Dr. George N. Papanicolaou, to whom the honor belongs for initiating the great interest in the study of exfoliative cells. The chapters, of which there are 10, take up the various phases of the vaginal smear method, including the technique, normal histology of the vaginal smear, characteristics of malignant cells in smears, sources of error, etc. Fifty photomicrographs are included to illustrate the normal and malignant cell characteristics. These photomicrographs are of excellent quality and are briefly but adequately described.

It is felt that this is a handbook that should be on the bookshelf of every pathologist as well as of every physician who has an interest in the early detection of cancer. A quotation from the author's preface should be well heeded: "No broad background in pathology and cytology is required to recognize many types of cells; however, only a pathologist having experience with the method will be able to evaluate some of the cells and be prepared to use the method as a means of study of early or premalignant lesions."

—K. P. Knudson, M. D.

INTRACRANIAL TUMORS, by Percival Bailey. *Professor of Neurology and Neurological Surgery, University of Illinois*, 2d edition. 478 pages, illustrated. Charles C Thomas, Springfield, Ill., publishers, 1948. Price \$10.50.

Dr. Bailey, distinguished Professor of Neurology and Neurological Surgery at the University of Illinois, has revised and rewritten his book on intracranial tumors which was first published in 1933. It was, at that time, one of the most readable and interesting books available to the student and practitioner. In this, the second edition, Dr. Bailey has retained the same outline integrating the developments of the past fifteen years with the material originally presented.

Following the discussion of tumors in general, which the reviewer believes should be read by all medical men interested in tumors; there is a clear, concise presentation of the anatomy of the cranium and its contents. Cerebral physiology is then covered in the same precise fashion. Dr. Bailey then presents each of the general histological types of intracranial tumors in a separate chapter. Each chapter begins with a brief historical reference followed by the presentation of one or two cases just as they would be given at a clinic. The history and symptomatology are described by means of simple sketches, questions and answers, and the responses to various performance tests. Then follows a discussion of the diagnosis and treatment. In addition to the sketches and diagrams in each chapter, there are presented, at the end of the book, a group of plates of characteristic roentgenograms accompanied by brief descriptions.

Following the specific tumors, there are chapters on general diagnosis, differential diagnosis, and treatment of intracranial tumors. Here, too, the reader's interest is maintained and stimulated by case histories presented clearly and precisely. The book closes with a chapter on the treatment, the need for prompt diagnosis followed by surgical intervention, the difficulties of surgery, and the results that may be expected.

This book, in addition to providing the reader with accurate information on intracranial tumors, accomplishes what so few medical texts do; namely, it provides the reader with interesting, accurate, informative material in a manner that is stimulating and maintains his attention to the end. It should be read

by, and be in the library of every physician and surgeon whose practice includes diseases of the nervous system, in other words, every practicing physician.

—Lt. (jg) W. W. Ledyard (MC), U. S. N. R.

TUBERCULOSIS, A Discussion of Phthisiogenesis, Immunology, Pathologic Physiology, Diagnosis, and Treatment, by Francis Marion Pottenger, A. M., M. D., LL. D., F. A. C. P., Emeritus Professor of Medicine, University of Southern California, the School of Medicine; Medical Director, the Pottenger Sanatorium and Clinic for Diseases of the Chest, Monrovia, California. 597 pages; illustrated. The C. V. Mosby Company, St. Louis, Mo., publishers, 1948. Price, \$12.

This text presents a comprehensive discussion of phthisiogenesis, immunology, pathologic physiology, diagnosis, and treatment. It was written by a man with long experience in the diagnosis and management of tuberculosis. Much of the material presented is based upon Dr. Pottenger's personal experience and does not always reflect the consensus or prevailing opinions of others equally versed in the field of tuberculosis.

The author recognizes the importance of a knowledge of phthisiogenesis for an understanding of tuberculosis in any of its many phases. The first six chapters are devoted to this subject. Dr. Pottenger looks upon the primary infection as a vaccination which creates specific protection and were it not for the fact that it also furnishes a focus from which future metastases may arise, it would be wholly desirable.

Also of particular value are the two chapters dealing with visceral neurology of pulmonary tuberculosis. This subject is probably as thoroughly covered as will be found in any text. The effect of acute and chronic pulmonary inflammation upon other organs and tissues through visceral reflexes produces signs and symptoms which would be of value in diagnosis and treatment if these were not so often overlooked. The physical examination is presented in a manner that does much to eliminate error which has made this procedure difficult and unsatisfactory. The author's approach to the disease is largely immunologic and physiologic.—Commander R. O. Canada (MC), U. S. N.

GIFFORD'S TEXTBOOK OF OPHTHALMOLOGY, by Francis H. Adler, M. D., Professor of Ophthalmology, University of Pennsylvania Medical School. 4th edition. 512 pages; illustrated. W. B. Saunders Company, Philadelphia, Pa., publishers, 1947. Price, \$6.

Each new edition of Gifford's Textbook of Ophthalmology has represented significant improvement over its predecessor and has properly reflected the more significant intervening advances in ophthalmology but has continued to maintain the general style and appearance of the parent edition. The fourth edition, however, represents a radical change in appearance, arrangement, and treatment of the subject matter. It represents in fact, a substitution of Doctor Adler's personality for that of Doctor Gifford. This fact does not, however, reflect adversely on the work, it merely means a change in the character of the book which has enhanced its worth by shifting more emphasis to the pertinent neurologic and physiologic aspects of ophthalmology. Ophthalmologists in general confess to some weaknesses in these fields and certainly no one is more qualified to present these subjects than Doctor Adler. Therefore the new and/or revised chapters on Disturbance of Ocular Motility, Ocular Disorders Due to Diseases of the Central Nervous System, and Ocular Manifestations of General Diseases, are particularly valuable as coming from one eminently able to write with authority on these subjects. They, along with the remainder of the book, will prove most useful to any physician seeking authoritative but simplified treatment of these subjects. The subjects of refraction, orthoptics, and the more common ophthalmic operations have either been eliminated or dealt with in a very abbreviated manner. This is considered fitting in a treatise primarily designed for students

and general practitioners (however the book can well serve at the graduate level). In the revision of this popular textbook Doctor Adler has liberally exercised his triple responsibility of preservation, creation, and destruction with the net result that a very fine but new fourth edition has emerged which should find a very useful place with the ophthalmologist as well as students and general practitioners. One naturally wonders, however, why with Doctor Adler's fine reputation it should be necessary to capitalize on the Gifford name in presenting this very worthwhile work.—*Capt. W. L. Berkley (MC), U. S. N.*

DISEASES OF THE GALLBLADDER AND ALLIED STRUCTURES, Diagnosis and Treatment, by ① Moses Behrend, M. D., F. A. C. S., F. I. C. S., *Consulting Surgeon, Jewish Hospital and Mt. Sinai Hospital; formerly Thoracic Surgeon, Philadelphia General Hospital, and Department of Tuberculosis and the State Sanatorium, Hamburg, Pa.; Associate in Surgery, Jefferson Medical College.* Foreword by Thomas A. Shallow, M. D., *Samuel D. Gross Professor of Surgery, Jefferson Medical College.* 290 pages; 110 illustrations, 6 in color. F. A. Davis Co., Philadelphia, Pa., 1947. Price \$7.

There is a tremendous amount of information in this small volume. There is an adequate discussion of the embryology, anatomy, anatomical relations, and physiology of the liver, biliary system, and pancreas. The author devotes a chapter to the findings in tests of liver functions, pointing out the pitfalls to be avoided in their interpretation. He proceeds to the pathology of the gallbladder, liver and pancreas, followed by a discussion of the symptoms of gallbladder disease. Then follows a discussion of the problems which arise in the diagnosis and treatment of gallbladder disease. The medical aspects of treatment, including fluids and antibiotics, have been stressed as well as the surgical aspects of treatment. He systematically covers anesthesia, pre- and post-operative treatment, and describes the surgical techniques employed. There is appended a bibliography of the more recent literature through 1946 for further reading.

The numerous illustrations are good. This book is recommended for the general practitioner, the internist, and the surgeon.

—*Commander M. T. Yates (MC), U. S. N.*

PRACTICAL OFFICE GYNECOLOGY, by Karl John Karnaky, M. D. 247 pages, amply illustrated. Charles C Thomas, Springfield Ill., publisher, 1947. Price \$7.50.

In this first edition of Practical Office Gynecology, the author embellishes many of the fundamental concepts of gynecology with an abundance of newer, logical concepts of treatment and diagnosis. The author's style is clear and direct.

The book is divided into two major portions. The first part of the text deals with the theories of endocrine control of the female from infancy through old age. The management of dysmenorrhea and sterility are covered in a very practical manner.

Part two of the book discusses the various gynecological conditions and disorders.

The recognition, diagnosis, and current modes of treatment are ably discussed, illustrated and presented. The book contains many illustrations and colored microphotographs which aid the reader in the recognition of the various disorders.

This book is recommended reading for the student in gynecology, for it presents many newer advances in diagnosis, therapy and treatment of gynecological disorders that cannot be found in any of the older standard texts.

—*Lt. (jg) R. H. Montgomery (MC), U. S. N.*

AVIATION MEDICINE IN ITS PREVENTIVE ASPECTS, An Historical Survey, by John F. Fulton, O. B. E., M. D., D. Sc., *Sterling Professor of Physiology, Yale University.* 174 pages. Oxford University Press, London, 1948. Price \$3.50.

This book consists of five lectures delivered by the author at the London School of Hygiene and Tropical Medicine in 1947 under the auspices of the Heath Clark Foundation.

The first lecture on Altitude Sickness and Acclimatization recounts a brief history of the use of oxygen in aviation. This lecture includes a description of "Operation Everest," an experimental project conducted by Commander Charles Houston, a Naval flight surgeon, in which 4 healthy young volunteer subjects proved themselves able to adjust to altitude levels of 22,000 to 23,000 feet in a low pressure chamber without use of supplementary oxygen. This operation covered a period of 32 days and on the last day the chamber was taken to a simulated altitude of 45,000 feet where, by breathing pure oxygen, the subjects were quite comfortable.

The effects of change in altitude on the human organism are dealt with in the second lecture of the series. Included here is a discussion of bubble formation in blood and tissues at high altitude and the development of bends. The problem of selecting pilots who are relatively "bend resistant" for high altitude missions is an important one.

In the third lecture of the series, Dr. Fulton discusses Pressure Cabins and the problems relating thereto. In view of the increasing use of pressure cabins in commercial aircraft, this work is most timely.

The fourth lecture deals with the effects of acceleration dim-out and black-out. Considerable space is given to a discussion of protective measures against black-out, namely, the "G-suit." The role the human centrifuge has played in the development of protective measures is related in a most interesting style.

The problems of safety in flight are dealt with in the final lecture. The advances in aviation safety are briefly discussed and a challenge to continue the good work toward the goal of safer flight is made.—*Capt. H. G. Shepler (MC), U. S. N.*

PHYSIOLOGIC THERAPY IN RESPIRATORY DISEASES, by Alvan L. Barach, M. D., *Associate Professor of Clinical Medicine, Columbia College of Physicians and Surgeons; Assistant Attending Physician, Presbyterian Hospital, New York, N. Y.* 2d edition. 408 pages; 74 illustrations. J. B. Lippincott Company, Philadelphia, Pa., publishers, 1948. Price \$9.

In recent years, we have come to a clearer understanding of respiratory diseases. Advances in anesthesia and surgery have made procedures within the thorax much less formidable. More and more we are thinking of disease in terms of altered physiology. It is only logical that our therapy should be directed along the same lines. In Dr. Barach's book, the pathologic physiology of each disease is presented clearly and concisely. The author calls on his extensive clinical experience in specifying the proper physiologic therapy.

After covering the most commonly encountered respiratory diseases, the text then proceeds to a detailed description of various methods, drugs, and equipment used in treatment. Oxygen therapy, care and use of resuscitators, aerosols, positive pressure, and means for oxygen analyses are all included. The chapter on oxygen poisoning is particularly recommended.

This book should be of special value to the internist, surgeon, and anesthesiologist. Inasmuch as each chapter is more or less complete in itself, one-chapter sittings would be the ideal type of reading for the busy doctor to aid him in retention of useful information.—*B. H. Pender, M. D.*

RECENT ADVANCES IN ENDOCRINOLOGY, by A. T. Cameron, C. M. G., M. A., D. Sc. (Edn.), F. R. I. C., F. R. S. C., *Professor of Biochemistry, Faculty of Medicine, University of Manitoba; Biochemist, Winnipeg General Hospital.* 6th edition. 443 pages; 74 figures, including three plates. The Blakiston Co., Philadelphia, Pa., publishers, 1947. Price \$6.

This book could replace the book entitled "Endocrinology in Modern Practice" by William Wolf which is becoming outdated as a 1939 publication.

The author presents a rather complete and fairly concise picture of endocrinology.

The book discusses the endocrine glands giving (a) the anatomy, (b) the normal physiology, (c) the pathologic picture of the abnormal glands, (d) the dysfunctions of the endocrines, (e) the therapy of the dysfunctions, and (f) the therapeutic uses of the hormonal secretion of the glands.

The functional abnormalities are well presented with many case studies including photographs and photomicrographs of the cases. In this respect the book is outstanding.

A major portion of the book is devoted to the thyroid gland and presents an excellent study of this most interesting organ.

Although much of the discussion and many of the photographs on pituitary disease are taken from the excellent textbook of Cushing, the work is brought up to date and truly presents recent advances in the field of endocrinology.

The references throughout the book are myriad and of real value to the individual with zeal to search further into some subject presented in the book.

In general the book is readable, presented in an interesting manner, and comprehensive in its coverage of the endocrine glands.

—Lt. L. W. Faw (MC), U. S. N.

TREPONEMATOSIS, by Ellis H. Hudson, M. D., D. T. M. and H. (London), *Director, Health Service, Ohio University, Athens, Ohio; Captain, Medical Corps, United States Naval Reserve*, edited by Henry A. Christian, A. M., M. D., LL. D., Sc. D. (Hon.), F. A. C. P., Hon. F. R. C. P. (Can.), *Hersey Professor of the Theory and Practice of Physic, Emeritus, Harvard University; Clinical Professor of Medicine, Tufts College Medical School; Physician-in-Chief, Emeritus, Peter Bent Brigham Hospital; Visiting Physician, Beth Israel Hospital, Boston, Mass.* 114 pages. Oxford University Press, New York, N. Y., publishers, 1946. Price \$2.50.

The author believes that treponematosiis should be the term applied to those universally distributed diseases having as a common etiologic factor a single causative agent, *Treponema pallidum*, and which present different clinical patterns under varying sociological conditions. The diseases caused by this organism have been given various names such as bejel, yaws, and syphilis; however, Dr. Hudson gathers them all under one word, treponematosiis, a name not influenced by time or place, its sole implication being that the disease is caused by a treponeme.

Needless to say there is a wide divergence of opinion in this connection, as the belief that different species of treponemes are the etiological agents of many diseases which are entirely unrelated to each other is rather well supported. It is the opinion of the author, however, that these so-called specific diseases are merely syndromes which constitute apparently unrelated diseases, genetically having a close relationship, in which the environmental factors such as climate, civilization, and habits have acted on the organism, *T. pallidum*, over a long time to produce marked variations in their effect on the human body.

The problems of how syphilis developed and the controversial relationship of the discovery of the New World to the spread of syphilis is discussed in great detail. He shows in a convincing manner that the true origin of the disease was the African continent, it being introduced into Europe through slave trading and by the returning Crusaders.

Dr. Hudson's familiarity with all the clinical and pathological aspects of treponematous diseases, as well as with the related historical material, both recent and ancient, has enabled him to write a most readable book which should be both interesting and instructive to the physician:—Lt. W. W. Taylor (MSC), U. S. N.

EYE SURGERY, by H. B. Stallard, M. B. E., M. D. (Cantab.), F. R. C. S. (Eng.), *Assistant Eye Surgeon, St. Bartholomew's Hospital; Eye Surgeon, Radium Institute and Mount Vernon Hospital; Late Surgeon, Pathologist, and Curator, The Royal London Ophthalmic (Moorfields Eye) Hospital; Major, R. A. M. C. (T. A.)*. 444 pages; 338 illustrations. The Williams & Wilkins Company, Baltimore, Md., publishers, 1946. Price \$11.

The material discussed in this book is arranged in such a manner that each step in the pre-operative care, anesthesia, the actual step-by-step technique of each operation, and the post-operative management is clearly defined. This method of presentation should be of great value to the younger ophthalmic surgeons.

Principles and practice of eye surgery as performed by the author are described in minute detail. As a result the variability of procedures is limited.

The volume is presented in 12 chapters; the first 2 deal with instruments and their care, sterilization of equipment and materials, pre- and post-operative preparation, anesthesia and analgesia; the next 8 chapters describe the details of extra- and intra-ocular surgery; the final 2 chapters describe traumatic surgery of the eye and lids and the surgical problems of the orbit itself.

There are no references appended since this volume is primarily a record of methods finally adopted by the author apparently to suit his own judgment and technical aptitude. Almost every procedure described is justified by critical comment in regard to the basic technique.

This is an excellent reference for the resident in ophthalmology and for the intern.—*Commander S. H. Oliver (MC), U. S. N.*

ESSENTIALS OF PUBLIC HEALTH, by William P. Shepard, B. S., M. D., M. A., *Third Vice-President, Health and Welfare Division, Metropolitan Life Insurance Company; Clinical Professor of Public Health and Preventive Medicine, Stanford University School of Medicine; in Collaboration with Charles Edward Smith, M. D., D. P. H., Professor of Public Health and Preventive Medicine, Stanford University School of Medicine; President, California State Board of Health, Rodney Rau Beard, M. D., M. P. H., Associate Professor of Public Health and Preventive Medicine, Stanford University School of Medicine; Manager, Medical Department, Pacific-Alaska Division, Pan American World Airways, and Leon Benedict Reynolds, A. B., Sc. D., Professor of Hydraulic and Sanitary Engineering, Stanford University*. Foreword by Ray Lyman Wilbur, M. D., LL. D., Sc. D., *Chancellor, Stanford University; Ex-Secretary of the Interior; formerly President of Stanford University*. 600 pages. J. B. Lippincott Company, Philadelphia, Pa., publishers, 1948. Price \$5.

The authors have presented a very difficult subject in a readable fashion. Unfortunately the subject of public health as presented in medical schools or in refresher post-graduate courses is looked upon lightly, and, as a consequence, the relation of the doctor to his community, either directly or indirectly, does not develop as early as one would like to see it done in this age of specialty.

The authors repeatedly emphasize the role of the physician in the field of public health.

The chief criticisms rest in the layout plan and editing of the text. The various chapters, subjects, and even paragraphs are titled much too often, resulting in a broken continuity of thought and interest. The use of fine print in many chapters, and the choice of such lightweight paper in this small book, interferes with an easy understanding of many pages of the text. Many charts and graphs show through the respective pages.

There is a great profusion of editorial errors in scientific spelling and nomenclature such as: *B. typhosis* for *S. typhi*; *Citellys* for *Citellus*; *S. enterides* for *S. enteritides*; *hermosii* for *hermsi*; and *C. pipilus* for *C. pipiens*.

In the chapter on insect and rodent control many important agents of disease are omitted. These could well be included in view of their public health importance. The final chapter on statistics is well presented.

—*Lieutenant Commander W. J. Perry (MSC), U. S. N.*

COMMON SKIN DISEASES, General Practice Series, by A. C. Roxburgh, M. A., M. D., B. Ch. Cantab, F. R. C. P. London, *Emeritus Physician for Diseases of the Skin and Lecturer on Diseases of the Skin, St. Bartholomew's Hospital; Consulting Physician and Lecturer, St. John's Hospital for Diseases of the Skin; Dermatologist to the Royal Masonic Hospital; Past President, British Association of Dermatology and Syphilology; Past President, Section of Dermatology, Royal Society of Medicine; Past Vice-President, Section of Dermatology, British Medical Association; Late Editor of the British Journal of Dermatology and Syphilis; Late Consultant in Dermatology, Sector III, Emergency Medical Service; Late Temporary Surgeon, Royal Navy; Corresponding member of the Danish Dermatological Society; Associate of the Royal Photographic Society*. 8th edition. The Blakiston Company, Philadelphia, Pa., Toronto, Canada, publishers, 1948. Price, \$7.

This manual, already in its sixteenth reprint or edition since 1932, presents sufficient dermatology in an agreeable form to make it stand apart from the conventional handbook form of presentation. The opening chapters, often a loss in other texts, discuss etiology, pathology, signs, and symptoms in an engaging style. Perhaps the most valuable feature is the stress laid on differential diagnosis with the use of tables and outlines and with cross-reference by page to similar dermatoses. The illustrations are well-chosen and are not in excess, and the volume is not cluttered with extensive bibliographic reference lists. The sections on treatment, except when too dependent on British Pharmacopoeia measures, are inclusive and timely. The index is adequate and workable.

The book is good reading and of practical value to the student and busy practitioner requiring a ready reference manual.—*Capt. R. L. Gilman (MC), U. S. N.*

THE ANATOMY OF THE EYES AND ORBIT, Including the central connections, development, and comparative anatomy of the visual apparatus, by Eugene Wolff, M. B., B. S. (Lond.), F. R. C. S. (Eng.), *Ophthalmic Surgeon, Royal Northern Hospital; Surgeon, Pathologist and Lecturer in Anatomy to the Westminster Branch of the Moorfields, Westminster and Central Eye Hospital; Late Demonstrator of Anatomy, University College; Late Chief Clinical Assistant, Royal London Ophthalmic Hospital (Moorfields) and Ophthalmic Registrar, University College Hospital*. 3d edition. 440 pages, 323 illustrations, 24 in color. The Blakiston Company, Philadelphia, Pa., publishers, 1948. Price, \$12.

This book is a standard textbook for students in ophthalmology and for ophthalmologists. It is written clearly and concisely, yet does not omit detail in its anatomical descriptions. Beginning with the bony orbit, gross and microscopic anatomy of the eye, its appendages, muscles, nerves, and vessels are thoroughly covered and beautifully illustrated. In addition, biomicroscopy, central nervous connections and pathways, embryology, and comparative anatomy are covered.

This book should be considered a "must" for the student in ophthalmology.

—*Lt. T. E. Atkinson, Jr., (MC), U. S. N.*

A PRACTICAL MANUAL OF DISEASES OF THE CHEST, by Maurice Davidson, M. A., M. D., Oxon, F. R. C. P. Lond. *Physician to the Brompton Hospital for Consumption and Diseases of the Chest; Sometime Dean of the Brompton Hospital Medical School; Associate Physician to the Miller General Hospital for Southeast London; Consulting Physician to the Western Ophthalmic Hospital; Hon. Consulting Physician to the Papworth Village Settlement, Cambridge*. 670 pages, illustrated. 3d edition. Geoffrey Cumberlege, Oxford University Press, New York, N. Y., 1948. Price, \$16.50.

This is the third edition of this text on Diseases of the Chest, which is primarily of interest to one beginning the study of pulmonary disease. It reviews the anatomy and physiology of the lungs and respiratory passages as well as the pathological anatomy of diseases discussed.

The text is well illustrated with roentgenograms and case histories of typical cases of the diseases under consideration.

Certain recent considerations of diseases of chest such as bronchspirometry and cytological studies of sputum in bronchogenic carcinoma as well as some of

the less important diseases of the chest are neglected entirely or discussed too briefly.

The literary style used in this book is representative of the excellent composition one frequently finds in professional writings on medical subjects by English authors.—*Commander T. C. Ryan (MC), U. S. N.*

DEAFNESS, TINNITUS, AND VERTIGO, by Samuel J. Kopetzky, M. D., F. A. C. S., *Director of Department and Professor of Otolaryngology, New York Polyclinic Medical School and Hospital*. 314 pages, illustrated. Thomas Nelson & Sons, New York, N. Y., publishers, 1948. Price \$7.50.

This well-known author is an authority on the subjects he discusses. However, he has added very little to the current knowledge of otology by his newest book. The plan of the book was developed from notes used in a series of lectures and graduate student conferences given by the author. In the reviewer's opinion, the information contained in Dr. Kopetzky's book can be found by reference to any one of several standard texts. The obvious efforts throughout the book to discredit the surgical treatment of clinical otosclerosis are repetitious and antagonistic. The modern surgical treatment of clinical otosclerosis as developed by Holmgren and Sourdille, and streamlined by Lempert, stands out as the greatest advancement in otology in 50 years, whether or not it has reached a stage of perfection at the present time. It should be encouraged, not attacked, unless a more suitable method of treatment, not yet publicized, has been discovered.

—*Capt. A. J. Delaney (MC), U. S. N.*

DENTAL CARIES, Mechanism and Present Control Technics as Evaluated at the University of Michigan Workshop, edited by Kenneth A. Easlick, A. M., D. D. S., *Ann Arbor, Michigan; Professor of Dentistry (Dentistry for Children) in the School of Dentistry and Professor of Public Health Dentistry in the School of Public Health*, with 19 collaborators. 234 pages, illustrated. The C. V. Mosby Company, St. Louis, Mo., publishers, 1948. Price \$5.

This book is an account of a conference held at the University of Michigan, School of Public Health, on the evaluation and control of dental caries by recognized authorities in the various fields of Dentistry. The book follows the pattern of the conference, that is, an essay is read followed by a question and answer discussion. Each essay is about 2,500 words. An evaluating committee appraises the information and answers sets of prepared questions on: (a) the mechanism; (b) the relation of systemic conditions; (c) the effectiveness of prophylaxis, toothbrushing, chewing gum, dentifrices, and mouthwashes; (d) the utilization of fluorides and silver salts; (e) the relationship of ingested vitamins and minerals; and (f) the contribution of various types of diet, as applied to, or control of, dental caries.

The material is well organized and presented in an orderly fashion. This book is recommended for dentists and dental hygienists in the field of Public Health.—*Commander A. Bartelle (DC), U. S. N.*

ESSENTIALS OF PATHOLOGY, by Lawrence W. Smith, M. D., F. C. A. P., *Formerly Professor of Pathology, Temple University School of Medicine, Associate Professor of Pathology, Cornell University Medical School, and assistant Professor of Pathology, Harvard Medical College. Corresponding Member of the Royal Flemish Medical Academy of Belgium*, and Edwin S. Gault, M. D., F. C. A. P., *Associate Professor of Pathology and Bacteriology, Temple University School of Medicine*. 3d edition. The Blakiston Company, Philadelphia, Pa., 1948. Price \$12.

This excellent textbook of pathology is intended for medical students. There is no attempt to present the entire present-day knowledge of this highly specialized and complex subject, but rather to write a textbook to present the "essentials of pathology." This the authors have done in an orderly, systematic, and practical manner.

The subject is presented in three major categories, namely: (a) General pathology; (b) oncology; and (c) systemic pathology. The innovation of case history as a corollary to the discussion of each topic is new for a textbook of pathology. Because of its recognized teaching value this method of presentation is again being more widely used in other textbooks of medicine.

The book is well illustrated not only by gross and microscopic pictures, but by numerous roentgenograms. The photomicrographs are particularly good.

This book is too limited in its scope for use by anyone interested in an extensive knowledge of pathology, but would be an excellent ready reference for those who wish only to keep abreast of pathology in general. Individuals such as internists, surgeons, or those preparing for their specialty board would find it particularly valuable.—*Commander H. V. O'Connell (MC), U. S. N.*

BOOK NOTICES

Receipt of the following books is acknowledged. As far as practicable, these will be reviewed at a later date.

THE 1948 YEAR BOOK OF GENERAL THERAPEUTICS, edited by Oscar W. Bethea, Ph. M., M. D., F. A. C. P., *Professor of Clinical Medicine, Tulane University School of Medicine (retired); Senior in Medicine, Southern Baptist Hospital; Consulting Physician, Charity Hospital; Member of the Revision Committee of the U. S. Pharmacopoeia 1930-40; author of "Clinical Medicine" and "Materia Medica, Drug Administration and Prescription Writing."* 480 pages. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1948. Price \$4.25.

NEUROLOGICAL ANATOMY IN RELATION TO CLINICAL MEDICINE, by A. Brodal, *Prosector of Anatomy, University of Oslo, Formerly Assistant of the University Neurological and Psychiatric Clinics in Oslo.* 496 pages. Oxford University Press, New York, N. Y., publishers, 1948. Price \$14.75.

WARD MANAGEMENT AND TEACHING, by Jean Barrett, R. N., M. A., *Professor of Nursing Education; Director, Department of Nursing Education, Syracuse University School of Nursing; Formerly Associate Professor of Nursing Arts, Yale University School of Nursing.* 399 pages. Appleton-Century Crofts, Inc., New York, N. Y., publishers, 1949. Price \$4.

OPERATING ROOM TECHNIQUE, by Edythe Louise Alexander, R. N., *Supervisor of the Operating Rooms of the Roosevelt Hospital, New York City, Formerly Supervisor of Operating Rooms, Mountainside Hospital, Montclair, New Jersey; Supervisor of Private Pavilion Operating Rooms, New York Hospital, New York City.* 765 pages with 668 illustrations. 2d edition. The C. V. Mosby Company, St. Louis, Mo., publishers, 1949. Price \$10.

SCIENCE AT WAR, by J. G. Crowther, *Chairman, Association of British Science Writers;* and R. Whiddington, C. B. E., F. R. S., *Head, Department of Physics, University of Leeds.* 185 pages, illustrated. The Philosophical Library, New York, N. Y., publishers, 1948. Price \$6.

REFRACTION OF THE EYE, by Alfred Cowan, M. D., *Professor of Ophthalmology, Graduate School of Medicine, University of Pennsylvania; Active Consulting Ophthalmologist, Philadelphia General Hospital; Consulting Ophthalmologist, Council for the Blind and Supervising Ophthalmologist of the Department of Public Assistance, Commonwealth of Pennsylvania.* 3d edition, thoroughly revised. 287 pages with 187 illustrations and 3 colored plates. Lea & Febiger, Philadelphia, Pa., publisher, 1948. Price \$5.50.

TEXTBOOK OF THE RHEUMATIC DISEASES, edited by W. S. C. Copeman, O. B. E., M. D., F. R. C. P., *Physician to the Rheumatism Department and Lecturer in the Medical School, West London Hospital; Physician to Arthur Stanley Institute of Rheumatic Diseases (Middlesex Hospital) and Hunterian Professor, R. C. S.; Senior Physician the Hospital of St. John and St. Elizabeth; Consultant for Rheumatic Diseases Royal Hospital for Incurables, and Consultant to L. C. C.; Hon. Medical Secretary Empire Rheumatism Council; Member of Minister of Health's Advisory Sub-Committee; Chairman of Chartered Society of Physiotherapy and of the British Branch of Ligue Internationale contre le Rhumatisme; Examiner in Physical Medicine for Royal*

College of Physicians; Heberden Medallist (1940), with 24 collaborators. 612 pages, illustrated. The Williams & Wilkins Company, Baltimore, Md., publishers, 1948. Price \$12.50.

EMERGENCY SURGERY, by Hamilton Bailey, F. R. C. S. (Eng.), F. A. C. S., F. I. C. S., F. R. S. E., *Surgeon, and Surgeon-in-charge of the Genito-urinary Department, Royal Northern Hospital, London; Senior Surgeon, St. Vincent's Clinic and the Italian Hospital; Surgeon, Consolation Hospital, Lambeth; General Surgeon, Metropolitan Ear, Nose, and Throat Hospital; Consulting Surgeon, County Hospital, Chatham, Potter's Bar Hospital and Clacton Hospital; formerly External Examiner in Surgery, University of Bristol*. 6th edition, in 5 parts; sold in complete sets only. Vol. I, pp. 1-180; Vol. II, pp. 181-388, illustrated. The Williams & Wilkins Company, Baltimore, Md., publishers, 1948. Price \$25 for complete set of 5.

AN INTRODUCTION TO GASTRO-ENTEROLOGY, by Walter C. Alvarez, *Professor of Medicine, University of Minnesota, The Mayo Foundation and a Senior Consultant in the Division of Medicine, the Mayo Clinic. Author of "Nervousness, Indigestion and Pain"*. 4th edition, revised and enlarged. 903 pages, 269 illustrations. Paul B. Hoeber, Inc., Medical Book Department of Harper & Bros., New York, N. Y., publishers, 1948. Price \$12.50.

PSYCHOTHERAPY, Its Uses and Limitations, by D. Rhodes Allison, M. D., M. R. C. P., and R. G. Gordon, M. D., D. Sc., F. R. C. P. 160 pages. Oxford University Press, New York, N. Y., publishers, 1948. Price \$3.

PARATHYROID GLANDS & METABOLIC BONE DISEASE, Selected Studies, by Fuller Albright, A. B., M. D., *Associate Professor of Medicine, Harvard Medical School, Boston, Mass.; Physician, Massachusetts General Hospital, Boston, Mass.; and Consulting Physician, Massachusetts Eye and Ear Infirmary, Boston, Mass.*, and Edward C. Reifstein, Jr., A. B., M. D., F. A. C. P., *Consultant in Charge, Department of Clinical Investigation, Sloan-Kettering Institute of Cancer Research, Memorial Hospital Cancer Center, New York; Clinical Research Consultant, Ayerst, McKenna and Harrison, Ltd., New York; formerly Research Fellow in Medicine, Harvard Medical School, Boston, Mass.; and formerly Graduate Assistant in Medicine, Massachusetts General Hospital, Boston, Mass.* 393 pages, illustrated. The Williams & Wilkins Company, Baltimore, Md., publishers, 1948. Price \$8.

STANDARD RADIOGRAPHIC POSITIONS by Nancy Davles, M. S. R., C. T., *Senior Radiographer, Malvern General Hospital, Malvern, formerly Sgt./Radiographer-in-charge, Queen Alexandra Military Hospital, Millbank, London (attached No. 18 Coy, R. A. M. C.), and Radiographer-in-charge, Royal Surrey County Hospital, Guildford, Royal Gwent Hospital, Newport, Caernarvonshire and Anglesey Infirmary, Bangor, Royal Infirmary, Worcester, and Radiographer, Royal Infirmary, Derby, and Ursel Isenburg, M. S. R., Radiographer, Royal Free Hospital, London, formerly Radiographer, Willesden General Hospital, London, London Homeopathic Hospital, Research Worker, Institut Municipal d'Electro-Radiologie (Prof. Zimmern), Paris, and Radiographer, Rudolf Virchow Hospital (Dr. G. Bucky), Berlin*. 2d edition. 223 pages, illustrated. The Williams & Wilkins Company, Baltimore, Md., publishers, 1948. Price 21 shillings.

SYNOPSIS OF PSYCHOSOMATIC DIAGNOSIS AND TREATMENT, by Flanders Dunbar, M. D., with the assistance of Jacob Arlow, M. D., Raymond Hussey, M. D., Bertram Lewin, M. D., Robert C. Lowe, M. D., Sydney Rubin, M. D., E. Schnelder, M. D., Lester W. Sontag, M. D., and Members of the Staff of the Departments of Medicine and Psychiatry, Columbia-Presbyterian Medical Center, New York City. 501 pages. The C. V. Mosby Co., St. Louis, Mo., publishers, 1948. Price \$6.50.

OPTOMETRY, Professional, Economic, and Legal Aspects, by H. W. Hofstetter, *Associate Professor of Optometry, The Ohio State University, Columbus, Ohio*. 412 pages, illustrated. The C. V. Mosby Company, St. Louis, Mo., publishers, 1948. Price \$6.50.

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DISEASES OF THE NOSE, THROAT AND EAR, A Handbook for Students and Practitioners, by I. Simson Hall, M. B. Ch. B., F. R. C. P. E., F. R. C. S. E., *Surgeon to the Royal Infirmary, Edinburgh (Department for Diseases of Nose, Throat and Ear); Lecturer in Diseases of Nose, Throat and Ear, University of Edinburgh*. 4th edition. 463 pages, illustrated. The Williams & Wilkins Company, Baltimore, Md., publishers, 1948. Price \$4.50.

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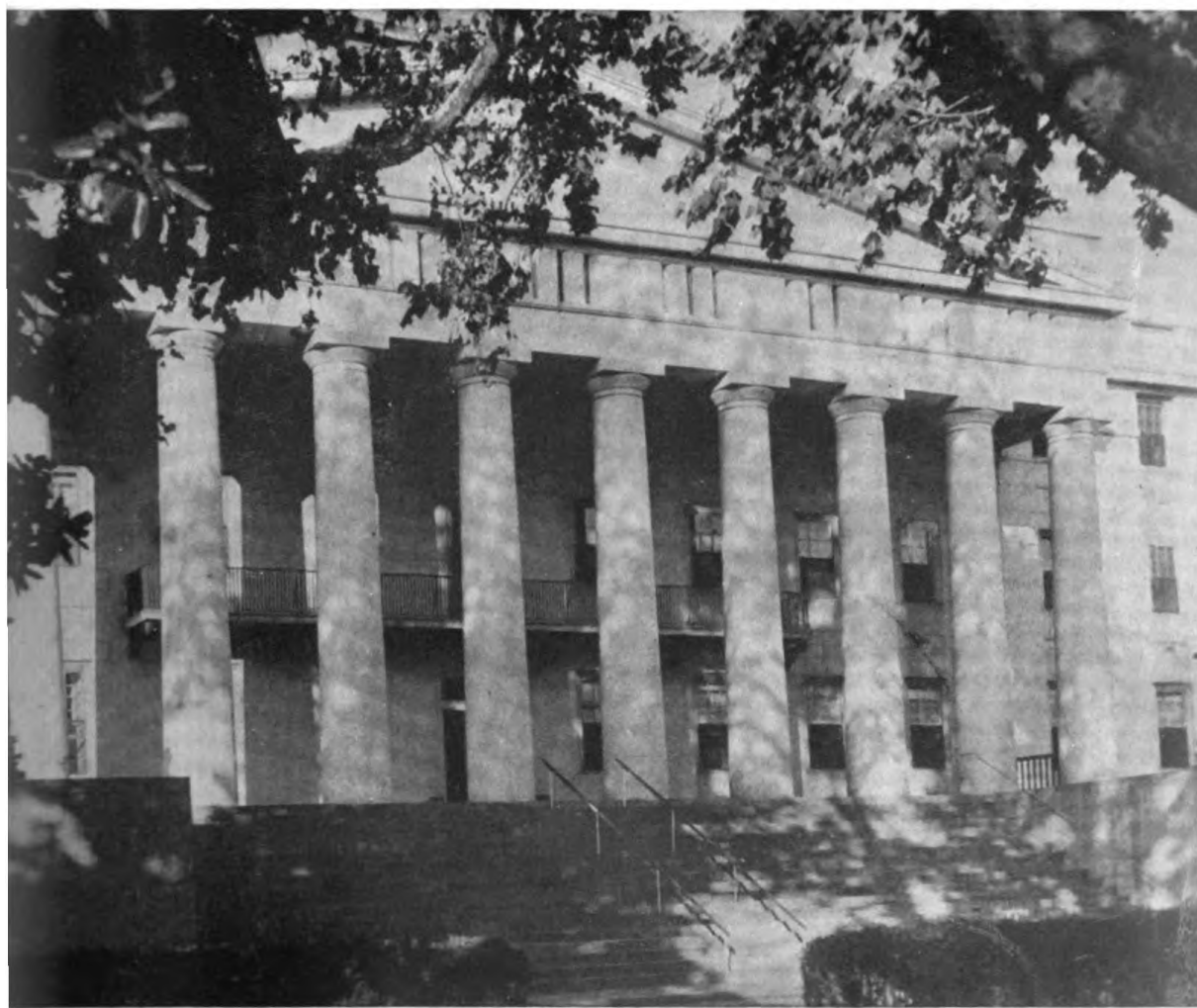
September–October 1949

Volume 49—Number 5

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has the distinction of being the first U. S.
Naval Hospital. It was commissioned in
1830.***

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Vol. 49

SEPTEMBER-OCTOBER 1949

No. 5

UNITED STATES NAVAL MEDICAL BULLETIN

THE MISSION OF THE MEDICAL DEPARTMENT OF THE NAVY
TO KEEP AS MANY MEN AT AS MANY GUNS
AS MANY DAYS AS POSSIBLE



BIMONTHLY

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JOSEPH L. SCHWARTZ, Captain (MC), U. S. N., Editor

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NAVY DEPARTMENT,
Washington, March 20, 1907.

THIS UNITED STATES NAVAL MEDICAL BULLETIN is published by direction of the Department for the timely information of the Medical and Hospital Corps of the Navy.

TRUMAN H. NEWBERRY,
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PREFACE



The UNITED STATES NAVAL MEDICAL BULLETIN was first issued in April 1907 as a means for supplying Medical Department personnel of the United States Navy with information regarding the advances which are continually being made in the medical sciences, and as a medium for the publication of accounts of special researches, observations, or experiences of individual medical officers.

With the establishment of the Nurse Corps in 1908, the Dental Corps in 1912, and the Medical Service Corps in 1947, the function of the BULLETIN was broadened to serve in a similar capacity for members of those Corps.

It is the aim of the Bureau of Medicine and Surgery to furnish in each issue special articles relating to naval medicine and dentistry, editorial comment on current literature of special professional interest to Medical Department personnel, clinical notes on interesting cases, descriptions of suggested devices, reports from various sources, notes and comments on topics of professional interest, and notices of newly published professional books.

The Bureau extends an invitation to all officers of the Medical Department to prepare and forward, with a view to publication, contributions on subjects of professional interest.

The Bureau does not necessarily undertake to endorse views or opinions which may be expressed in the pages of this publication.

CLIFFORD A. SWANSON,
Surgeon General, United States Navy.

III

NOTICE TO CONTRIBUTORS



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JOSEPH L. SCHWARTZ, *Editor,*
Captain, Medical Corps,
United States Navy.

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**The Association of Military Surgeons
of the United States**

will hold its

Annual Convention 10, 11, 12, November 1949

Statler Hotel

Washington, D. C.

Membership in The Association of Military Surgeons of the United States is extended to include Medical and Dental officers, Medical Service Corps officers, Nurse Corps officers, and all other officers of the Medical Departments of the several services of the Armed Forces, the Public Health Service, and the Veterans Administration.

The Association hopes that all officers will take advantage of the opportunity to support the Association and to actively participate in its work.

ADDRESS YOUR REPLY TO
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NAVY DEPARTMENT, WASHINGTON 25, D. C.
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19 September 1949



WASHINGTON 25, D. C.

Fellow Officers of the Medical Department of the Navy and U. S. Naval Reserve:

I would like to call your attention to The Association of Military Surgeons of the United States, an organization whose professional contacts are world-wide. Its aim and purpose is to provide a medium for the reciprocal interchange of opinions, views and ideas among the officers of the Medical Departments of the several services of the Armed Forces, the Public Health Service, and the Veterans Administration. It is one of the oldest existing societies of military medical men in the world. It holds an honored and revered place among the scientific and medical organizations in this country and it is unique in that it is the only organization in the United States which represents the specialty of military medicine. It was founded by Dr. Nicholas Senn in 1891 and has counted among its members men who are now among the immortals in the annals of medicine.

The far-reaching consequences of the observations of military surgeons have been a boon to mankind. The epochal work of Walter Reed and his associates concerning the transmission and control of yellow fever, the brilliant work of Gorgas in mosquito control, of Russell in the prevention of typhoid fever, of Waterhouse, the first to use smallpox vaccine in America, of Darnell who first introduced the use of liquid chlorine for the purification of water, and of Stitt who advanced the knowledge of tropical medicine by his publications in that field as well as in the field of bacteriology, stand out as landmarks in the advance of medicine. The work of these and of many other notable members of The Association of Military Surgeons has served to enhance and advance the specialty of military medicine, and has also served to promote the physical welfare of the personnel of our Armed Forces, as well as to relieve the suffering of man everywhere.

I urge you to join The Association of Military Surgeons of the United States, for that organization needs you and wants you. It is only through the concerted and coordinated efforts and thoughts of many minds and the reciprocal interchange of ideas that advantages can accrue, not only to the benefit of the medical and the military personnel of the Armed Forces, but also to the benefit of the health of our citizens and the welfare of our country.

Very sincerely,

A handwritten signature in cursive script that reads "C. A. Swanson".

C. A. SWANSON
Rear Admiral (MC) USN
Surgeon General, U. S. Navy

U. S. NAVAL MEDICAL BULLETIN

VOL. 49

SEPTEMBER—OCTOBER 1949

No. 5

ARTICLES



Concepts of Constitutional Medicine

I. Introduction

GEORGE L. CALVY, *Commander (MC) U. S. N.*

CONSTITUTION is defined as that aggregate of inherited characteristics, modified by environment, which determine the individual's reaction to the stress of environment (1). It is a basic belief of constitutional medicine that each individual possesses a factor of personal identity that marks him as a unique biological specimen. This approach follows the best Hippocratic tradition and has been the principal basis for all medical practice since ancient times.

In the nineteenth century, study of the total organism was gradually overshadowed by a greater interest in tissue and component parts, for the precepts of Pasteur, Koch, and Virchow provided a greater understanding of disease and the extrinsic and parasitic factors involved. Recent trends, however, reveal more concern for the host, man, as he adjusts or fails to adjust to socio-economic pressures (2) (3) (4) (5) (6) (7) (8).

In this country a significant trend in evaluating the man within the patient began in 1916 with the founding of the Constitution Clinic by Dr. George Draper at the Presbyterian Hospital, New York. Stimulus for this project arose from his observations during the 1916 poliomyelitis epidemic in New York City, that victims of this disease

exhibit many shared characteristics. During the following 30 years he searched intensively for a better understanding of people and the intrinsic factors which contribute to diseases such as peptic ulcer, pernicious anemia, coronary heart disease, diabetes, gallbladder disease, and rheumatic fever.

Draper conceived the idea of studying the total personality which he divided for convenience into four main categories, or panels. "The use of the term panel arose from the conception of a Japanese screen composed of four panels, across which was painted a complete picture; any one of the panels of such a screen alone would signify little, for upon it would be found but one phase of the whole" (1). The panels selected for investigation were: (a) Morphology; (b) physiology; (c) psychology; and (d) immunology. Data concerning the individual were gathered from all four panels.

This work furnished a spearhead in the development of modern psychosomatic medicine, for it was in 1928 that Draper's paper "Disease, A Psysomatic Reaction" (2) appeared. Other reports reflecting progressive refinement and precision of method followed and these directed attention to the man-environment unit (9), the emotional components of somatic disease (10), and inexorably, the unity of the organism (11). This emphasis is credited by both Cobb (3) and Braceland (7) for the present day awakening of the profession to the concept of psy(cho)somatic medicine. This cause was advanced by Alexander, Dunbar, Weiss and English, Wolf and Wolff, and others (12) (13) (14) (15).

MORPHOLOGY

Many methods have been used to investigate man's individuality. The natural beginning for such a study is the physical structure, the tangible basis of personality. This will be discussed further in this article.

Until recently there were no standardized descriptions or terms and thus the clinical use of physical anthropology had little popularity. Kretschmer and others attempted to classify men within specific types but taxonomy of this nature is inadequate. Sheldon (16) made a great contribution in this field by showing that there is a continuous distribution of patterns throughout a population. This fundamental idea is the basis of somatotyping as described by him in his book "Varieties of Human Physique." Sheldon bases his studies on photographs of the nude subject taken in standard manner in front, side, and rear views. Human morphology is described by Sheldon in terms of three primary aspects or components of structure that behave as though each were something which enters in varying amounts into every physique. These components are: I. Endomorphy, denoting

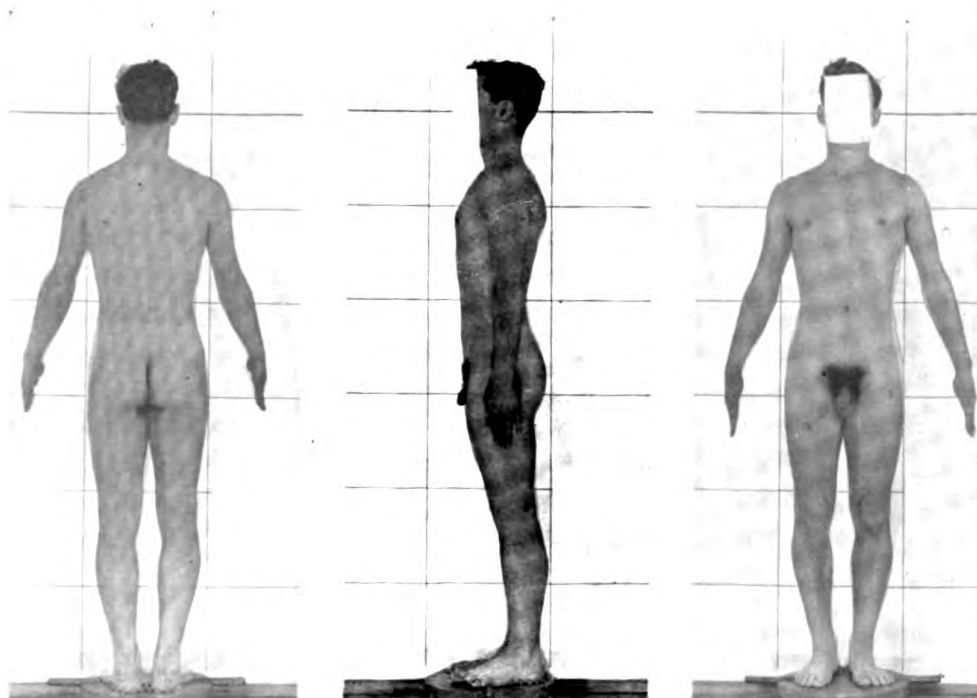


Figure 1.—The somatotype 4 5 2 in a young adult male.

presence of soft-roundness and the tendency to adiposity; II. mesomorphy, denoting presence of hardness and squareness (muscular and bony); and III. ectomorphy, denoting the presence of linearity, delicacy, and fragility of body structure.

Based on a study of several thousand individuals, Sheldon found that he could scale these components of structure on a 7-point basis. The pattern of the morphological components, expressed as a series of 3 numerals, one for each component, he called the somatotype of the person. Thus, a physique with average and equal expression of each component would be designated as somatotype 4 4 4. The circus fat lady, Hercules, and the carnival thin man show the maximal endowment of components I, II, and III, respectively, and bear the somatotypes 7 1 1, 1 7 1, and 1 1 7. About 80 distinct somatotypes have been identified using the 7-point scale (fig. 1).

Other morphological characteristics are observable and may be scaled in a comparable manner.

Androgyny expresses the pattern of bisexuality that exists in every person and which Draper (17) described as a mosaic. The andric and gynec factors are present in varying degrees of emphasis within the individual. These manifestations of sex in an extragenital sense are observable in all panels of the personality and may furnish valuable clues to diagnosis. An awareness of this mosaic and the character of its main theme (andric or gynec) in the individual is helpful

in understanding the distribution of disease by sex; as an example, gout afflicts males in over 95 percent of the recorded cases; the female with gout may exhibit striking andric characteristics of beard, muscularity, and driving aggressiveness.

Balance implies harmony of structure; disharmony or asymmetry of structure, from zone to zone of the body, is termed dysplasia and is suggestive of irregularities of growth and development. Sheldon (16) somatotypes five zones of the body: (a) Head and neck; (b) thorax; (c) lower trunk; (d) arms and hands; and (e) lower extremities. The final over-all somatotype is a summation of results from the foregoing.

Texture is an expression of fineness as opposed to coarseness in the organism and may be observed in the quality of the skin, hair, and nails; this factor may correlate with a "thoroughbred" quality which may enable the individual to perform unexpectedly well in spite of limited physical strength.

CLINICAL APPLICATIONS

White (18) recently announced that mesomorphy was a predominant feature in the somatotypes of persons with coronary heart disease; ectomorphy, in this same series of patients, was notably low. Further pursuit of this clue is in progress at research centers.

Males with gallbladder disease display more roundness and softness in their physiques than do ulcer patients, and also less ruggedness and linearity. The gynec emphasis is strong and the somatotype shows component relationships averaging 4 4 2½. On the other hand, ulcer patients vary widely in the morphological panel, bear no characteristic somatotype, but reveal their identity more clearly in the panels of physiology and psychology.

Dupertuis, a clinical anthropologist, noticed that diabetic patients fall into two distinct morphological groups. As a nonmedical person he was unaware of the existence of the insulin-sensitive and the insulin-resistant types of diabetes. His medical colleagues thereupon classified over 225 diabetic patients, from the case record, as either insulin-resistant or insulin-sensitive. There was significant correlation between the morphological and clinical classifications (table 1) (19).

TABLE 1

Group	Average somatotype	Response to insulin
I.....	5 3 2½	Resistant.
II.....	3 4 3	Sensitive.

Other fundamental relationships between physique and physiological function await investigation; both Dupertuis (19) and Tanner (20) have observed that serum cholesterol levels are high in individuals with predominantly endomorphic somatotypes. This may explain, in part, the occurrence of gallstones among endomorphic (soft-round, fat) persons.

Anthropology is but one aspect of the general approach but already it has served a useful purpose in a wide range of clinical studies. Draper (21) extended his observations regarding morphology at the microscopic level and demonstrated individuality, using the technique of cell culture. Distinct cell differences were demonstrable in those with peptic ulcer, gallbladder disease, poliomyelitis, and other disease patterns.

These and other findings in the morphological panel are but early gleanings. A more intimate and extensive investigation will surely lead to better diagnosis, prognosis, and treatment of many diseases.

SUMMARY

1. Sheldon's system of physical anthropometry offers a clinically applicable method for describing human physique.

2. The application of this technique to clinical medicine appears to offer promise for better understanding of the incidence of some diseases and of the man within the patient.

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Experiences With the Marrow Nail Operation According to the Principles of Kuentscher¹

Fractures Healed With Deformity, Old Fractures With Deficient
Callus Formation, and Pseudarthroses

PART III²

PROF. DR. C. HAEBLER

FRACTURES that have healed in bad position and most old un-
united fractures must be treated by "open marrow nailing."

The exposure facilitates the technique because the nail can be seen when it is driven into the distal marrow cavity. Compared with other methods of bone surgery, the marrow nail offers the advantage of avoiding a wide stripping of the periosteum; only that portion in the immediate proximity of the fracture is separated regardless of the mass of callus that has adhered to the fragments. Extensive resections are also avoided in most cases when the nailing method is used, since it is necessary only to provide two new joining surfaces and to open the closed marrow cavity, with a gimlet or awl, wide enough to allow the nail to enter; the callus is left intact as it constitutes an important element in bone regeneration and affords protection to the periosteum.

THE HAZARDS OF MARROW NAILING WITH EXPOSURE OF THE FRACTURE SITE

The hazard of infection exists when the fracture site is exposed, as was demonstrated in cases of compound fractures. There is less danger of infection if a wire suture or Lane's plate is used instead of the nail, especially if the osteosynthesis is not stable.

¹ Translation prepared by the U. S. Naval Technical Unit, Europe (Medical Section), Office of Naval Advisor, Office of Military Government (U. S.); edited by the U. S. NAVAL MEDICAL BULLETIN.

² Part IV of this article will be published in the November-December issue of the MEDICAL BULLETIN.

As shown in table 7, 35 infections occurred in 223 open nailings, or 15.6 percent, an alarmingly high figure. In our own clinic, the percentage of infections was less than 5 percent. Special circumstances evidently were responsible for the high infection rate indicated in table 7.

TABLE 7.—*Infections of the fracture cleft in the open nailing of aseptic fractures*

	Fresh fractures		Osteotomies		Old fractures and pseudarthroses		Total cases
	Number of cases	Number of infections	Number of cases	Number of infections	Number of cases	Number of infections	
Femur.....	3	0	32	9	44	1	79
Tibia.....	0	0	5	0	46	20	51
Upper arm.....	2	0	3	0	58	0	63
Forearm.....	1	0	6	0	23	5	30
Total.....	6	0	46	9	171	26	223

Osteotomies in old femur fractures were responsible for nearly 30 percent of the infected cases, but there was only one case of infection in ununited fractures.

This one case was caused by the negligence of the surgeon; a sponge was found in the cavity of the abscess of a patient who had had a nailing operation in another hospital 2 months previously.

Insufficient stability of the osteosynthesis cannot be considered the only reason for infection (although infections did develop in two osteotomy nailings in which the osteosynthesis was not stabile), because three old femur fractures with incomplete fixation healed primarily whereas there were seven cases of stabile osteosynthesis in which infections developed.

In seven, drains were not used and infection developed in five of these cases; inflammation developed in four other cases in spite of proper drainage and stabile osteosynthesis.

In cases of shortening and deformity the soft parts and vessels will be put under considerable tension if a nailing operation is performed immediately after an osteotomy; thus the resistance of the tissues to infection is lowered. Yet, it was observed that the areas which were damaged the most were not infected first, but on the contrary those old, healed fractures, where operation had been difficult and tedious, were the first to become infected.

The restoration of anatomic conditions as accurately as possible, and, above all, to compensate for shortening is the main objective of marrow nailing osteotomy. The marrow nail offers excellent possibilities in this respect, as it will not be necessary to resect the bone until the marrow cavity is exposed. It is possible to provide a canal

through the obstructing callus (by means of a gimlet and chisel) which will afford a very good hold for the nail; a complete restoration can thus be achieved by severing the bone at the old fracture line.

In old healed fractures this may prove difficult because there may be incredibly hard bone at the fracture site that offers no indication as to what is old and what is new. If the bone is severed at approximately the old fracture line new difficulties may arise as it will not be easy to determine the direction of the marrow cavity and to secure a path for the nail. When this condition arises the operation may last several hours and numerous roentgenograms must be made. This all leads to a possibility of infection. If, in addition to this, the soft parts are under tension and drainage is omitted or if pieces of callus are used to fill gaps and no solid junction is attained, infection is almost a certainty.

These difficulties will not be encountered if the fracture is still movable or recently healed. A poorly united femur fracture should, therefore, be operated on as early as possible.

If a fracture has been healed for sometime and the exact location for severance (at the fracture line) offers difficulties, the bone should be resected as conservatively as possible so as to establish broad adjoining surfaces and the marrow cavity should be opened. A shortening of the limb is inevitable when this is done, but this lessens the chance of infection. The marrow nail is advantageous in these cases over other methods as the resection may be done under more favorable conditions, a long period of immobilization is avoided, and the joints are moved early.

After a thorough study of our results I deem it advisable to accept a shortening and to shorten the other leg accordingly (using the marrow nail) rather than to forcibly lengthen the bone and thus expose the patient to the risk of an infection which might mean the sacrificing of the limb or even death.

The infection rate in old fractures of the tibia was high, 43 percent, but in our clinic not one infection occurred in the nailing of old fractures of the tibia (including fractures that had been united for more than 6 months). From this experience we can say that infection can be avoided if proper conditions and indications are observed.

Most of the infected cases in military hospitals were nailed by surgeons with little or no experience in marrow nailing; to their excuse it must be said that many old and poorly united fractures were seen in military hospitals, and the surgeons were fascinated by the new method and anxious to try it. Many overlooked the implications when reading Kuentscher. He stated that the marrow nailing is the simplest surgical approach "in typical cases," but nailing an old fracture of the tibia is not a "typical case" for marrow nailing; so it may be said that lack of

experience and technique are responsible for a large percentage of infections. The hazards are greater in these cases than they would be in old fractures of the humerus, many of which were nailed with exposure of the fracture site by surgeons with little experience.

Immobilization of the fracture site, without a doubt, plays an important part in the healing, for in 19 of 20 infected cases the osteosynthesis was only relatively stabile (as is so often the case in tibia fractures) and it was considered sufficient to splint the leg. If a plaster cast had been applied in these cases (as we always recommend) there probably would have been no infection. Twelve fractures with only relatively stabile fixation healed primarily in a plaster cast; 7 of them were originally infected fractures which had been healed for more than 6 months.

The flap incision appears to be particularly dangerous and resulted in four cases of skin necrosis from which the infection spread to the fracture cleft. A longitudinal incision along the lateral edge of the tibia is more suitable and has a better chance to heal because it is padded by soft parts.

The absence of sufficient padding of the skin increases the chances of infection because the suture line becomes subject to considerable tension post-operatively causing the sutures to cut into the skin thus lowering the resistance of the tissues to infection.

The chances of infection of the forearm are great if the suture line is close to the bone. In the humerus the two factors, insufficient stability, and lack of padding by soft parts, as a rule do not present the same hazard of infection.

If the patient's temperature rises after the operation it is imperative to open the wounds wide (including the opening entrance of the nail) to permit complete drainage. The limb must be immobilized in a plaster cast. If this is done the danger of infection is greatly reduced and sometimes avoided. These points were neglected in most of the cases previously referred to and much valuable time was lost by the administration of sulfonamides and application of wet compresses, during which time the swelling increased and the infection was forced into the fracture cleft and marrow cavity.

The following is an example of improper technique.

In osteotomy and nailing of a 10-week-old healed fracture (with a shortening of 6 centimeters in an axially correct position) (fig. 56a) the periosteum was widely stripped. Chips of callus were packed into the bone wound. The shortening could not be compensated by extension so the fracture ends were brought into proper position and nailed. Upon driving the nail into the distal marrow canal a piece of bone was broken off the posterior part of the distal fragment and because of this the nail did not find a firm hold (fig. 56b).

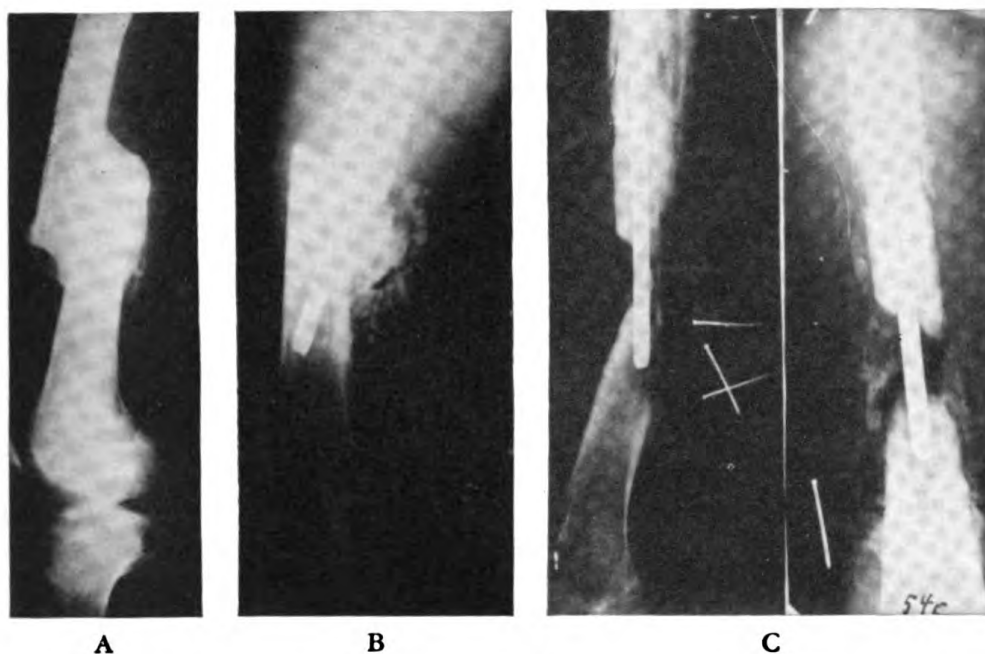


Figure 56.

The wounds were sutured without drainage and a Braun's splint applied. Although the patient's temperature rose to 39° C. the day following the operation and remained elevated, the wound was not opened until the eighth day at which time a large quantity of pus was drained off. Because the fracture was freely movable a wire extension was applied, which apparently corresponded to the length of previously stripped periosteum (fig. 56c). Union of the fracture ends was finally achieved in a plaster cast, thanks to the formation of a strong callus about the dead bone, and after 9 months the nail and sequestrum could be removed. A few abscesses had to be opened and sequestrums had to be removed later, but after 20 months the fracture had healed with a shortening of 2 centimeters, a stiffening of the knee joint in a 175° angle and a two-thirds stiffening of the ankle joint.

The operation on this patient was fully justified because a shortening of 6 centimeters, especially in young persons, is likely to produce severe damage to the hip joint. The fracture was suitable for nailing as far as could be determined. When it was found that a proper reduction would be met only with difficulties because of contracture of soft parts, a wire extension should have been applied. After the damage to the soft parts had subsided (probably 1 or 2 weeks) there was a chance that the marrow nailing could have been done uneventfully. Inasmuch as the leg had been prematurely nailed it should have been put in a plaster cast; the nail had no hold due to the breaking off

of a piece of the bone. Furthermore, drainage was imperative; when the patient's temperature rose above normal the wound should have been opened wide without delay. This would have prevented the infection from being forced into the marrow cavity along the nail. The abscess of the entrance wound would have been avoided, as would, in all probability, the large sequestrum. The excessive stripping of the periosteum very likely caused the bone necrosis. The reintroduction of pieces of callus was superfluous and increased the liability of infection. The same is true of the wire extension, because all it did was cause a distraction. A plaster cast would have been better.

It has been repeatedly asserted that exposure of the fracture will delay the formation of callus, but Fritz Koenig refuted this concept as early as 1931 and we have never observed delayed callus formation in the many patients operated on with exposure of the fracture site.

In cases where a delay was observed the reason was always traceable to faulty technique (improper position at rest, bone obstruction, faulty position of fracture, etc.); nor have we observed a delayed healing due to an open marrow nailing operation.

It must be emphasized, however, that the nail does not stimulate callus formation, but only assures favorable conditions for its formation. Where these favorable conditions do not exist because of lack of stability or other defects the nail will not only be useless but also dangerous.

Fat embolism may occur in both the open and closed nailing operation. Originally the author was of the opinion that pressure developing in the marrow cavity was the principal cause of fat embolism. However, after a careful study of many patients and the review of many case histories of fat embolism, the maltreatment of bone by the use of excessive force in driving the nail seems to be the principal cause of fat embolism. Also in old fractures of the femur an obstruction of the marrow cavity by connective tissue or callus permits a rise in intramedullary pressure when the nail is inserted and thus produces fat embolism. Therefore open marrow nailing operations are recommended for this type of fracture.

FEMUR FRACTURES

Osteotomy of obliquely healed fractures

Osteotomy and nailing of obliquely healed femur fractures led to infections in more than 30 percent of the cases and the consequences were rather severe for those patients.

The technical difficulties in nailing and the long duration of the operation are largely responsible for infection. The operation should, therefore, take place before the bone unites in faulty position.

Forcible compensation of shortening and angulation is usually accompanied by considerable damage to the soft parts and vessels and constitutes another important factor in infection. It is recommended that the operation be performed in two stages: In the first stage only the osteotomy is performed and a wire extension applied; then when the shortening is compensated and the wound completely healed (in about 2 or 3 weeks) the marrow nailing is done.

Osteotomy should be performed as conservatively as possible; the periosteum should be removed very sparingly at the line where the bone is to be cut (which should be identical with the old fracture line if possible). The bone should be cut in such manner as to provide a smooth abutment of the ends. In the second stage the marrow cavities should be opened, a canal for the nail drilled, and obstructing bone parts resected.

As a rule drainage must be provided through counterincisions placed posteriorly in the intramuscular septum. The author uses a long drainage tube which is led outside the bandage into a sterile flask; this prevents the bandage from becoming wet thus eliminating a potential source of infection. The tube must be sutured to the skin to prevent its withdrawal or shifting from the wound cavity.

Boehler emphasized the necessity of operating in two stages in all cases in which the shortening exceeded 4 centimeters, but we were guided primarily by the force necessary to correct the position after osteotomy. If no unusual procedure is necessary we do not hesitate to do primary nailings in shortenings up to 6 centimeters. On the other hand, we have performed the operation in two stages in cases where the shortening was less than 4 centimeters if the correction was difficult. In 4 cases in which the operation was performed in two stages we waited for primary healing of the wound before nailing. This procedure is more agreeable to the patient than a one-stage operation.

If the fracture had only recently united and callus is seen in the roentgenogram it can, in most cases, be easily chiseled off and the operation will present no difficulty. If, however, the fracture has been united for more than 8 weeks and has even been put under stress, we do not waste time trying to locate the old fracture line (which in most cases would be unsuccessful and would also increase the danger of breaking asepsis).



Figure 57a.

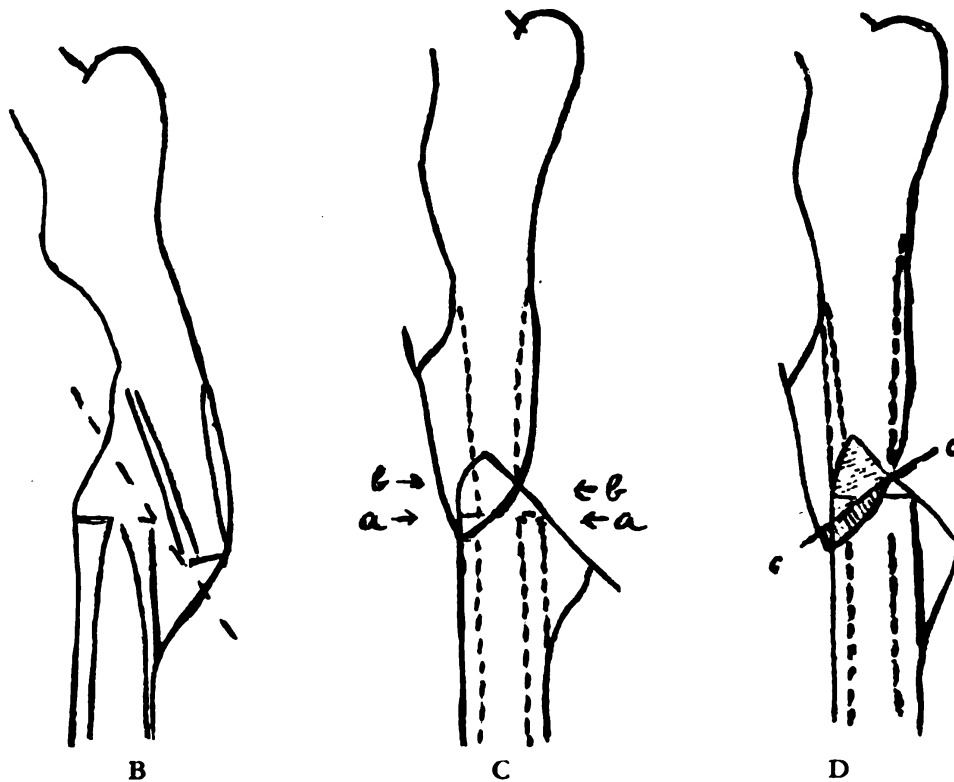


Figure 57b, c, and d.

In a 14-month-old fracture of the thigh which had been united for 10 months (fig. 57a) the shortening amounted to 3 centimeters. The patient limped and tired quickly and movements of the knee joint were limited by about 50 percent.

We made a sketch of the roentgenogram showing the separation line and indicating the old ends of the fragments (fig. 57b). The tracing was then cut and the two parts superimposed in such a manner that the lines indicating the ends of the fragments were laying upon one another and the angulation corrected. In this way the original shape of the bone was restored in an exact manner.

If the bones had been cut across at point *a—*a** (fig. 57c) the ends of the fragments would have touched each other on the medial side for only one-third of the circumference and would have had no protection against rotation, consequently osteosynthesis would not have been stable.

If the bones had been cut across at points *b—*b** (fig. 57c) a broad plane of contact would have been obtained but the callus of the distal fragment would have required drilling through and considerable difficulty would have been encountered in finding the marrow cavity and in inserting the nail.

Therefore the sketches were superimposed in such a way that a slight shortening existed. If the bone were cut along the line *c—c* (fig. 57*d*) both marrow cavities would have been opened and enlargement to receive the nail would have been simple. Furthermore, there is the advantage of a broad contact of the bone which makes for better stability.

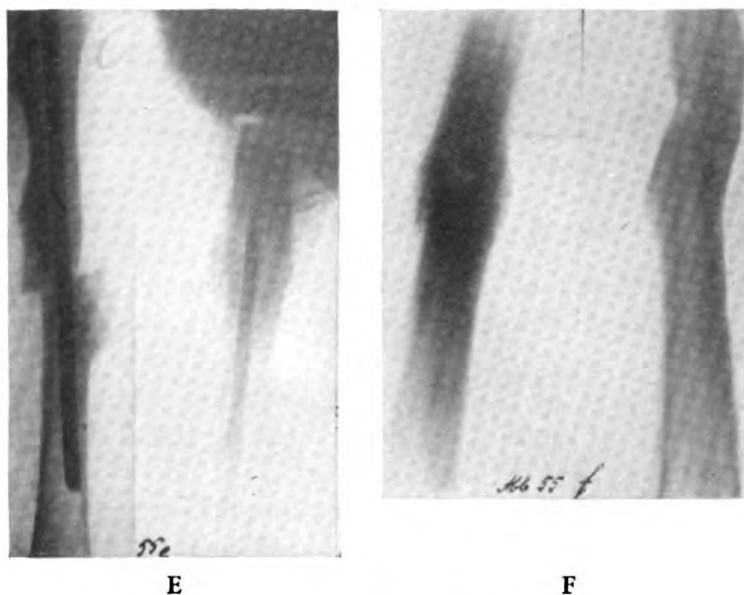


Figure 57*e* and *f*.

Figure 57*e* shows the fracture after nailing. The nail could have been longer, but it found sufficient hold in the marrow cavity, narrowed because of the callus. The osteosynthesis was stable and the shortening was one-half centimeter.

Five months after the operation (fig. 57*f*) the nail was removed. The fragments had healed in good position; there was no measurable shortening; and movement of the knee joint ranged from 80° to 180°.

It is possible to use the newly formed bone as part of the elongation as illustrated in figures 58 *a*, *b*, and *c*. Figure 58*a* is an 11-month-old gunshot fracture that had been treated with a traction bandage for 11 weeks and a plaster cast for 4 weeks. The wounds had been healed for 9 months and the shortening amounted to 6 centimeters. There existed a typical backward curvature of the knee joint with 50 percent limitation of movement. An osteotomy was performed along the old fracture line (fig. 58*b*). In order to reduce the shortening of the limb the tip of the distal fragment was not resected. Because of this it was difficult to locate the marrow cavity, therefore the nail did not lay in the proper axial direction, but was firmly seated in the callus canal. The osteotomy planes on the flexor side stood one over the other over a broad area and there was a satisfactory position of the axis.

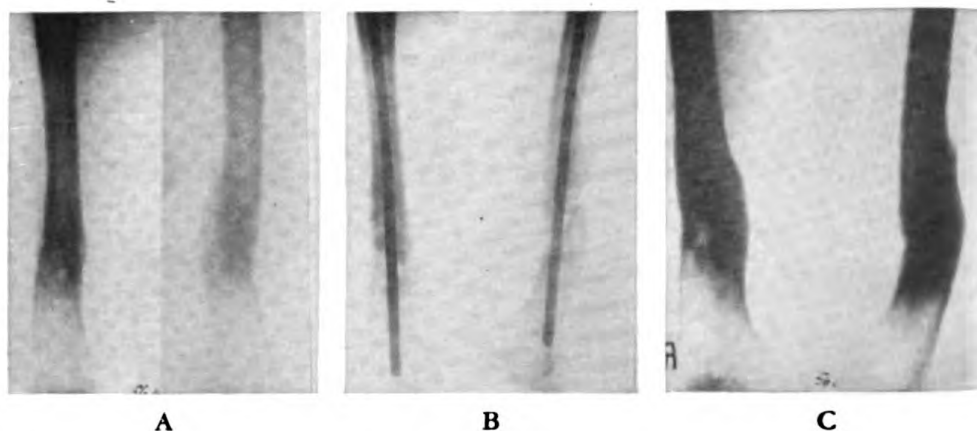


Figure 58.

The shortening thus amounted to only 1 centimeter. Drainage was applied in the dorsal direction for 2 days and a plaster cast kept in place for 3 weeks.

If the sound part of the marrow cavity had been opened, as is required by the old method of osteosynthesis, the shortening would have amounted to at least 5 centimeters.

Figure 58c is a roentgenogram taken 8 months after the operation. The nail had been removed 4 weeks previously. The patient was sent to his unit 2 months after the operation as fit for garrison duty. The shortening amounted to 1 centimeter and clinically there was no recurvation of the knee. Motion ranged from 180° to 60°.

We have abandoned the use of newly formed bone because it is often difficult (especially in old fractures) to find the marrow cavity and to provide a canal for the nail through the hard callus; furthermore the danger of piercing the cortex in the wrong direction is ever present, and the difficult and tedious manipulations are a serious hazard to asepsis.

In some instances it is best to accept a shortening, since there is always the possibility of shortening the other leg as proposed by Bauer. This carries less danger of infection and recovery is much faster.

Any callus that does not interfere with the proper reduction of the fracture is left untouched as it constitutes an important factor in the initiation of bone regeneration. The author does not deem it advisable, however, to reintroduce pieces of callus that have been removed. The detached pieces of callus are likely to decay and form foci of infection. Two cases treated in a military hospital in this manner resulted in severe infections.

It is important to conserve the periosteum as much as possible. The fact that it is permissible, in marrow nailing, to deviate from

Langenbeck's time-honored principle of the subperiosteal osteotomy, is definitely to the credit of the method. In the nailing osteotomy the periosteum is, in the first phase of the operation, only incised at the site of the osteotomy. After the bone is cut with a chisel or Gigli saw the periosteum should be loosened only as far as is necessary for bone resection.

Wide loosening of the periosteum is often held responsible for the delayed healing in old osteosyntheses. Whether this is true or not

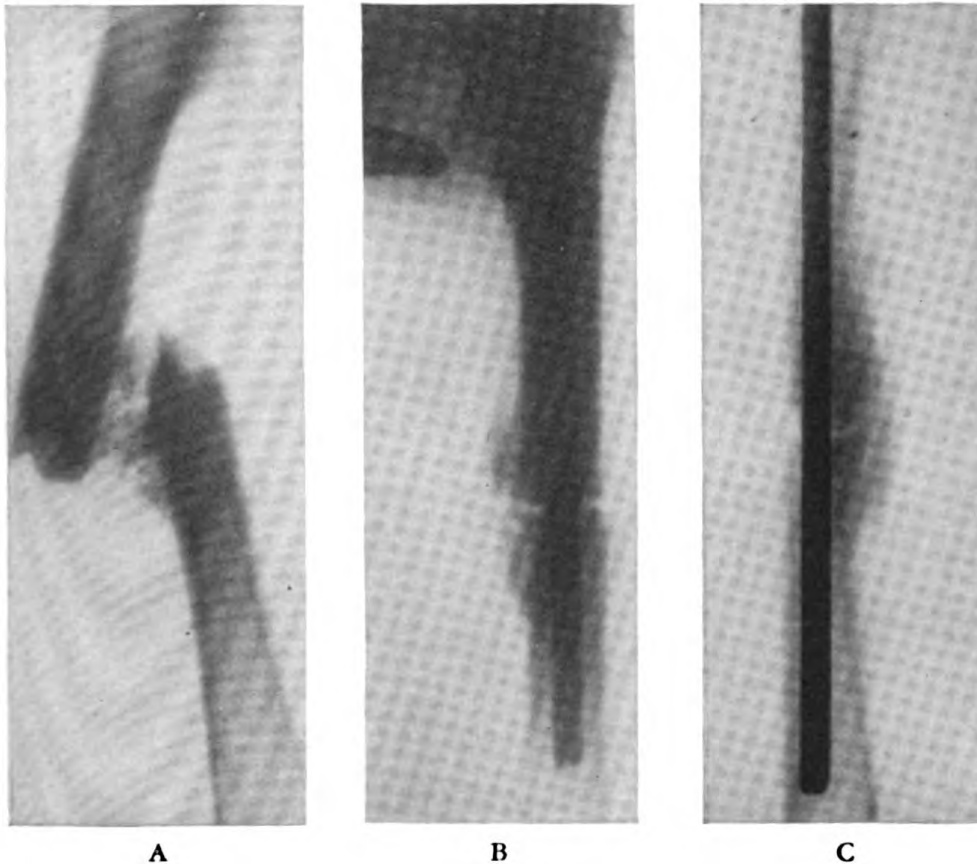


Figure 59.

it is difficult to say. The operation report of the fracture illustrated in figures 59 *a*, *b*, and *c* points out that: "the fracture ends were exposed with ample loosening of the periosteum," although soft callus could have been easily removed with a chisel. Figure 59*a* is a roentgenogram of a 6-month-old closed femur fracture. There was a shortening of 6 centimeters and marked angulation. Figure 59*b* shows the same fracture after nailing. The nail should have been longer. During the operation the ends of the fragments were "widely exposed subperiosteally in all directions," and the fragments were

resected until the marrow cavity was open. This caused a shortening of 2 centimeters. The wound healed primarily and the patient was ambulatory 4 weeks post-operatively.

One year after the operation (fig. 59c) the fracture was bridged over only at the medial side where the old remnants of callus were left untouched. The fracture cleft was still clearly visible in its entire length. It must be admitted that the nail was rather short, the decalcification next to the point indicated that the nail moved in the bone, but this should not, according to the author's experience, materially delay the healing of fresh femur fractures. This is, by the way, the only osteotomy of the femur treated by us that healed so slowly. In all other cases where the osteosynthesis was relatively stable the healing time was normal. It may, therefore, be safely said that the wide loosening of the periosteum actually caused the delay in healing.

Wide loosening of the periosteum is especially dangerous if infection sets in, for the denuded bone will undergo extensive necroses because of lack of nourishment.

Even if the nail is solidly engaged in the callus and the osteosynthesis is stable, it is still better to drill the nail path from the beginning in such a manner that a nail of sufficient size may be

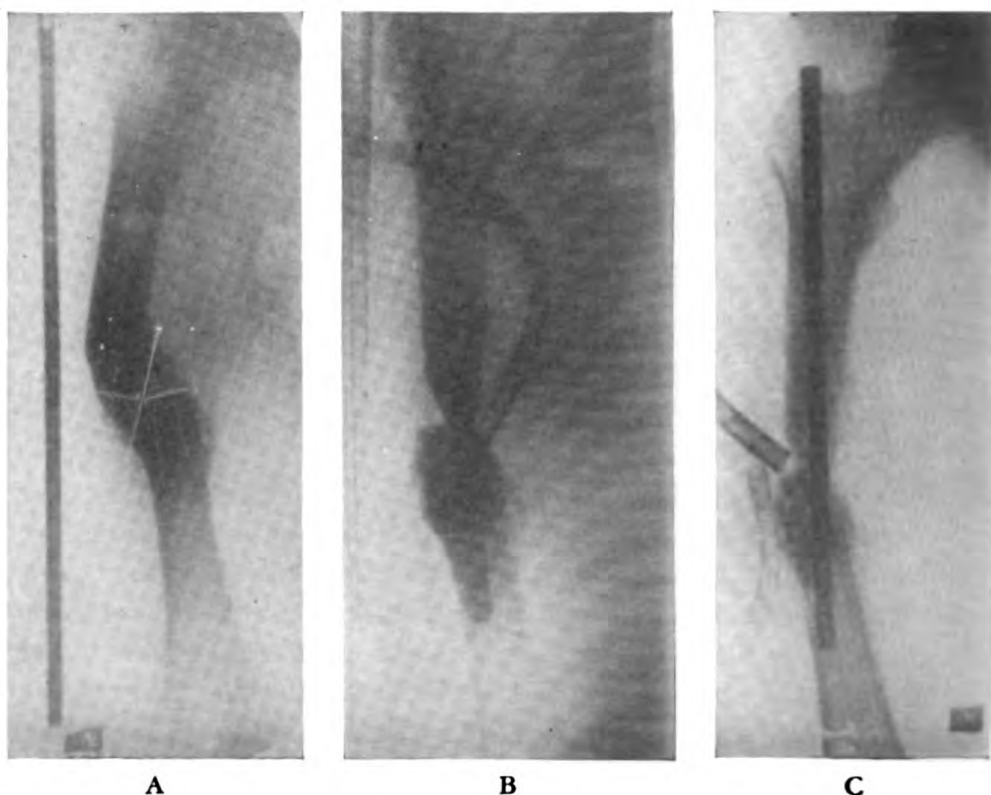


Figure 60a, b, and c.

driven in. We had this experience in an obliquely healed gunshot fracture. In this 3-year-old gunshot fracture (fig. 60*a*) the wounds had been healed for 1½ years, with shortening of 6 centimeters. The solid lines on the roentgenogram show the separation of the bone and the broken lines the area that had to be removed. The distal marrow cavity was not opened, and it was located by drilling Kirschner wires under x-ray control.

After locating the canal it was then enlarged (with ball trepan and chisel) wide enough to introduce a middle-sized nail. To determine the length of the nail required, a thin nail was introduced into the distal fragment. It was observed that the nail was laying at an angle and hit the corticalis when inserted 9 centimeters. We did not pay too much attention to it and refrained from drilling a new canal. The bone ends were then brought into position and held with a Lambotte's bone forceps and after checking by x-ray and securing good position, a groove was chiseled into the bone to avoid axial distortion. A guide rod was then introduced into the distal marrow cavity to measure the distance up to the trochanter. When the guide rod had pierced bone and skin at the trochanter a medium-sized nail was driven in, the length of which had been determined as follows: length of the proximal marrow cavity plus 4 centimeters (distance nail may jut out at the trochanter) plus 9 centimeters (length of canal in distal fragment). The nailing was uneventful and the fracture was absolutely stabile. The ends of the fragments joined only half the periphery (fig. 60*b*). A drain was inserted posteriorly and Braun's splint and plaster cast applied. The shortening amounted to 1½ centimeters. There was no abnormal tension of the musculature and the reduction was carried out without undue force. The patient had a slight fever for 2 days after the operation, but his temperature returned to normal on the third, therefore, on the fourth day the drain was removed. Then followed a sudden rise in temperature and the drain was reinserted and the leg put in a plaster cast. The patient's temperature then returned to normal. The drain was removed on the eleventh day and the cast on the twelfth day. The wounds had healed. On the twenty-first day after the operation the patient again had fever. Serum was palpable in the area of the fracture and this was punctured. The patient's temperature then returned to normal (staphylococcus was cultured from the serum) and remained normal; he began to move the limb on the twenty-sixth day. Two days later he was allowed to get out of bed, and after 35 days treatment was continued as an out-patient. The patient could use the leg without any trouble and could walk a considerable distance if he used a cane for support. Four weeks later he could walk without a cane and the mobility of

the knee which had previously been almost stiff had improved considerably.

Three and a half months after release from the hospital the patient returned to the clinic with an abscess on the outer side of the thigh which was incised. Roentgenogram (fig. 60*c*) showed, in addition to the loosening of the structure, a distinct neoformation of periosteum at the proximal fragment in the area of the point of the nail and below it a gradually increasing rarefaction of the cortex was observed (fig. 60*d*). The nail was removed although solid bony fixa-

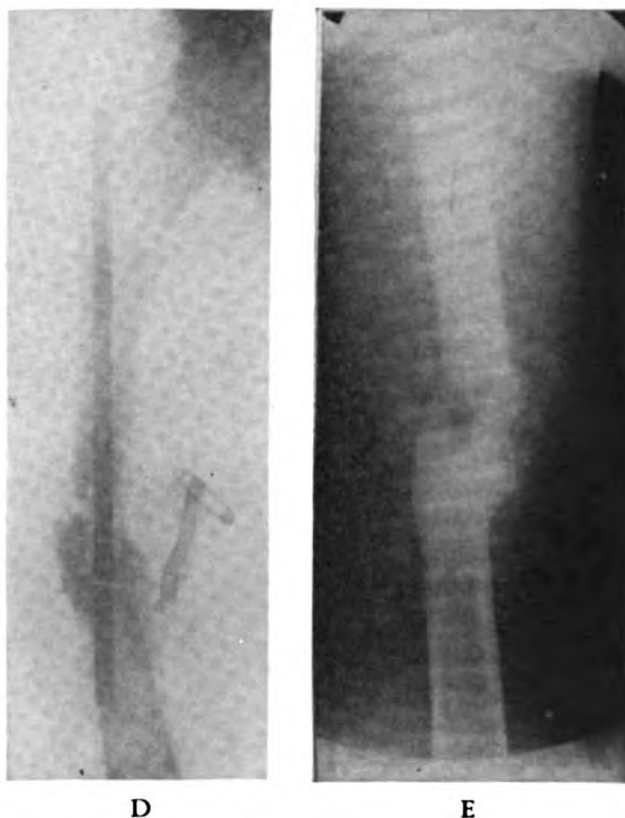


Figure 60*d* and *e*.

tion of the fracture could not be expected. A couple of abscesses had to be opened and a few sequestra removed and finally, 7 months post-operatively, the wounds had healed and a satisfactory fixation was achieved (fig. 60*e*) by use of extension, bandages, and plaster casts. Shortening was 2 centimeters and a satisfactory axial position obtained. The knee joint was movable between 180 and 90 degrees.

When dealing with torsion of the fracture site, osteotomy should be performed in the ideal portion of the bone, that is, the middle third. The extent of torsion is ascertained by determining the angle between the median line of the sole of the foot and the surface of the table at the

utmost inward rotation of the hip joint. The difference between the sound and affected side constitutes the necessary correction. After exposure of the bone and loosening the least amount of periosteum, a longitudinal groove is chiseled into the bone with the nail lying in position. The nail is then drawn back as far as the fracture cleft and the remaining bridge of bone cut through. A guide rod is then introduced into the nail and distal marrow cavity, and the distal fragment rotated to the extent necessary for correction; the longitudinal groove is displaced by 3.5 millimeters per 10° . By comparing with the sound leg at the utmost inward rotation of the hip joint, correct position is ascertained and the nail driven in. It will not be necessary to use a thicker nail, although it is recommended that the nail be driven in from 2 to 3 centimeters deeper; this will always be practicable.

In 23 nailing osteotomies, which were uneventful, the distortion could be completely compensated for except in 1 case. This was an osteotomy nailing of the femur of a 1-month-old fracture that was done in another hospital (fig. 61). The fracture had healed in a marked valgus position with a shortening of 2 centimeters. The wounds had been closed for 10 months. Four months after the operation the shortening amounted to 1 centimeter and the valgus position amounted to 15° . The nail was not inserted into the distal fragment in the proper axial direction.

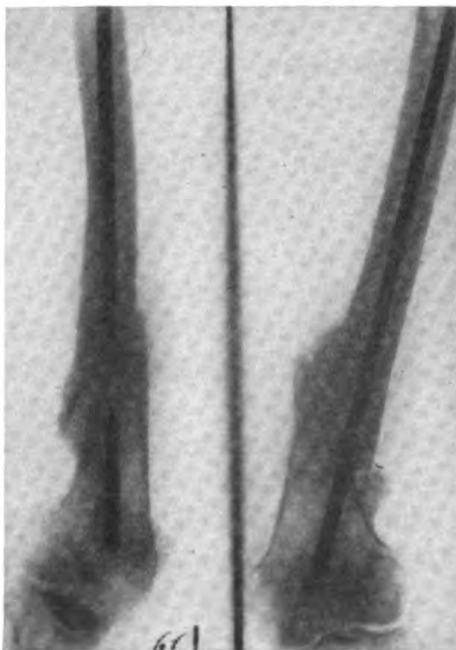


Figure 61.

Fractures of this kind are not suitable for nailing osteotomy; it is better to treat them by traction after the osteotomy (in old gunshot fractures nailing increases the danger of infection). A wire suture would not have been indicated because it would not have prevented the fragments from slipping and a Lane's plate would have been of little or no advantage over the simple wire extension.

In 11 cases of shortenings up to 3 centimeters, the compensation was 100 percent successful. In 1 case, shortening of $1\frac{1}{2}$ centimeters remained because the ends of the fragments were resected and in another the shortening was 1 centimeter.

In five shortenings of 4 centimeters the leg remained 1 centimeter too short in one case. A shortening of 5 centimeters was successfully com-

pensated; and in three shortenings of 6 centimeters the leg was 1 centimeter short in two cases.

Of special importance are the advantages of mobility of the joints. Before the osteotomy all 23 cases under consideration had limited mobility of the knee joint; in eight cases there was a limited mobility of the hip joint, some of them of considerable extent. In all fractures less than 9 months old full mobility was restored and in the older fractures joint mobility was considerably improved. The hip joint was movable in all and flexion of the knees was at least 90°.

Limited mobility of the joints may also be corrected by osteotomy and wire extension. The fact that a stiff knee joint resulted in four cases following infections weighs heavily on the method, as the final compensation of the shortening means very little to the patient if the price paid for it is a stiff joint.

OLD FEMUR FRACTURES IN BAD POSITION NOT COMPLETELY HEALED AND PSEUDARTHROSES

We were inclined to adopt the closed nailing method in all cases of old femur fractures because of the relatively high incidence of infection when open nailing was used. When the closed method is used the patient has all the advantages of closed marrow nailing of fresh fractures.

The closed nailing will be successful only if the fracture is thoroughly mobilized. If a fracture is more than 3 weeks old connective tissue fixes the fragments and makes correct reduction impossible. These fixations must be broken up forcibly.

In 20 femur fractures from 4 to 10 weeks old, we were always able to perform closed nailing after thorough mobilization; but in military hospitals this method is unsuccessful in fractures that were only 4 weeks old because the mobilization was omitted and exposure of the fracture site was necessary.

The surgeon who undertakes to nail old fractures must have had experience in the nailing of fresh fractures because the nailing of old fractures presents a number of additional difficulties. Although a reduction apparatus was not used in 16 of the 20 fractures nailed, we found that the use of this apparatus greatly facilitates matters and we recommend its use.

If shortening exceeds 5 centimeters it is recommended that wire extension be used after mobilization and then permit 8 to 10 days to elapse to allow shortening to be compensated. This method will greatly facilitate the operation.

It is necessary to make sure that the fracture ends abut properly before beginning the nailing operation. If they do not no time should be wasted with renewed mobilization and attempts at reduction, but

rather open marrow nailing should be done. The danger of infection is not so great in ununited femur fractures.

Above all we warn against the closed nailing of fractures more than 5 weeks old. (Death occurred in one case due to fat embolism.) Fat embolism may occur because the marrow cavity is closed by callus thus permitting a rise in intramedullary pressure when the nail is driven in. In femur fractures the danger of fat embolism is greater than the hazard of infection in open marrow nailing.

In 36 of our 44 cases of open nailed femur fractures, 4 to 40 weeks old, we observed the entire course. The stay in the hospital was from 47 to 215 days, or an average of 131 days, and the period of unemployment was from 86 to 240 days, or an average of 179 days. These figures were approximately the same for the 19 cases treated by the closed marrow nailing method.

What is of more importance is the fact that in one fracture only, and that was only 4 weeks old, was there a shortening (1 centimeter). All the other fractures, some more than 6 months old, healed without shortening.

In one femur fracture, 32 weeks old, in which the knee joint was beginning to stiffen, the operation restored it to a 90° mobility. In all other cases full mobility was restored although the knee joint's motion was considerably impaired before nailing.

There is no doubt but that in a majority of old femur fractures union will occur after bringing the fragments into contact by bloodless mobilization and a sufficiently long period of rest. The old methods of osteosynthesis were little better than this conservative treatment. The advantage of the marrow nail, however, is that an additional bandage to secure immobilization is not required and mobility of the joints is restored early. This advantage is so important that we give preference to the open nailing in cases of old femur fractures, provided a relatively stabile osteosynthesis can be achieved by the nail.

In deciding whether or not this is possible, it is necessary to consider the condition of the bone (especially in subtrochanteric fractures) as well as the location and form of the fracture. We have seen a wandering of the nail in the massive part of the trochanter in fresh fractures that could have led to new angulations and the loosening of the osteosynthesis. The danger of such wanderings is particularly great if the bone is atrophic, as in an old fracture. In such cases it is possible for the nail to break completely out of the proximal fragment. In cases of fractures below the middle third, in which the nail must be driven in as far as the line of the epiphysis into the spongiosa, the nail may enter the knee joint, if atrophy of the bone exists. The presence of bone atrophy, therefore, excludes marrow nailing in femur fractures.

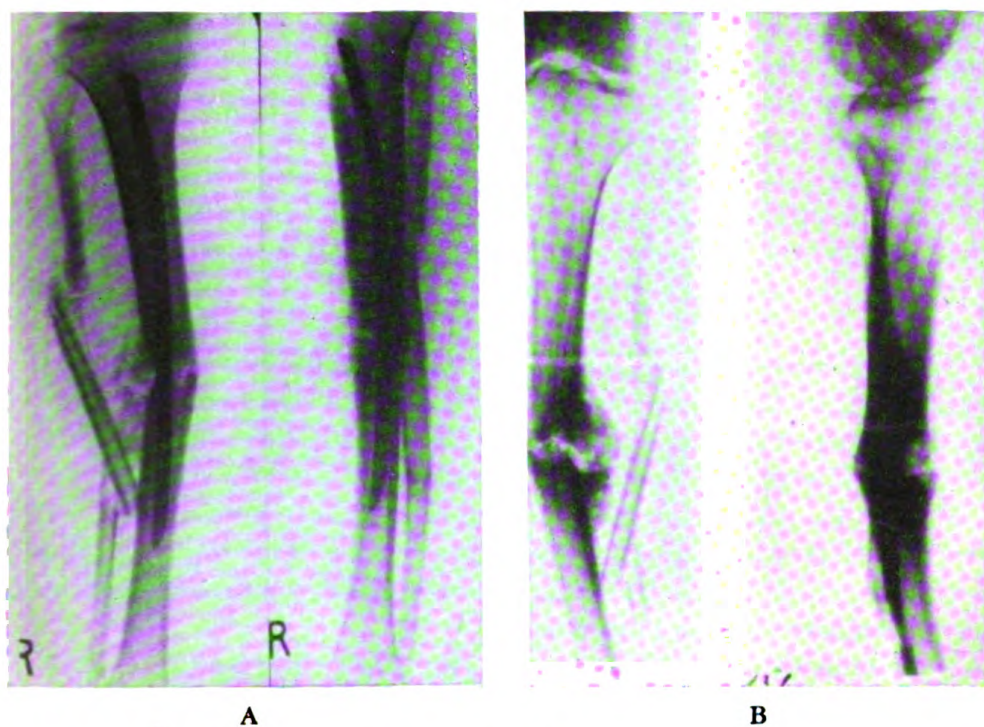
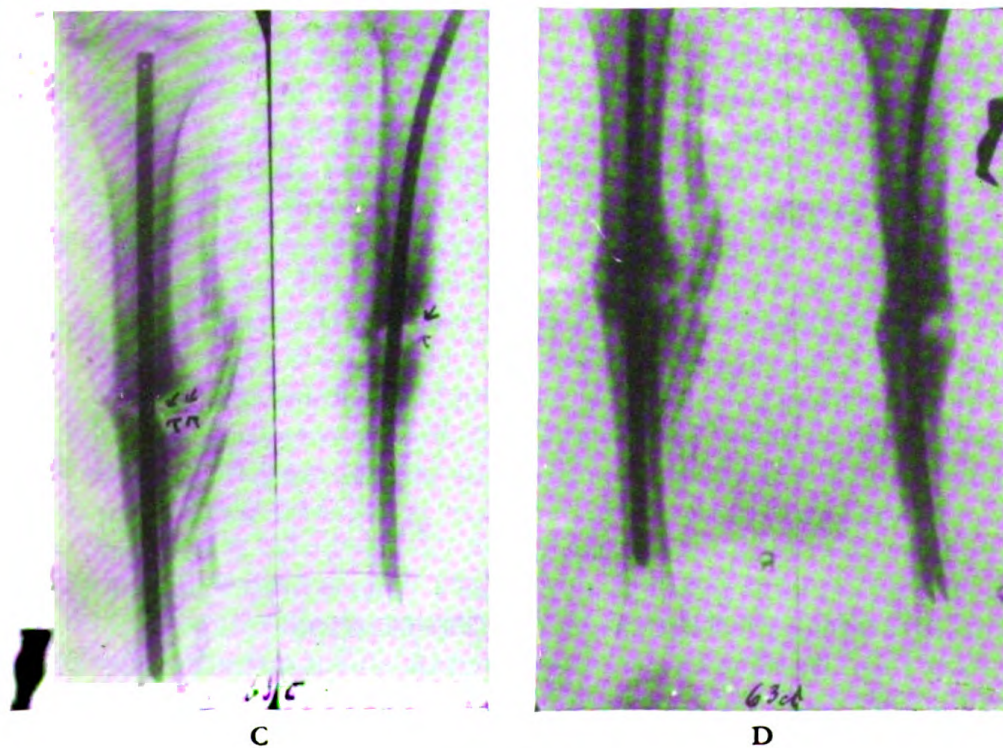
The possibility that these fractures will heal in bad position is small. Atrophy is usually associated with deficient callus formation, therefore a bloodless reduction of position will always be possible, at least to an extent that the use of the leg will not be seriously impaired. If the fracture does not unite in spite of satisfactory position, the nailing can be performed at a later date, after improvement of the calcareous content of the bone. If the calcareous condition is normal there should be no hesitancy in performing the nailing operation, if the position of the fracture is not satisfactory. The more solid a fracture becomes in faulty position and the greater the amount of callus formation the more dangerous the operation will be and the greater the possibility of infection. In such cases it would be better to perform a bloodless mobilization, followed by the application of a wire extension, if the shortening exceeds 4 centimeters. The nailing can then be done 8 or 10 days later when the shortening will have been corrected and the effects of the injury to the soft parts overcome. We also emphasize the necessity of inserting a long drain posteriorly for from 24 to 48 hours after nailing. This will greatly reduce the danger of infection.

Old ununited fractures which are less than 6 centimeters away from the trochanter or the knee joint are not suitable for open nailing. If, in these cases, the faulty position cannot be corrected with conservative methods, recourse must be made to osteosynthesis with wire or a Lane's plate in addition to a bone graft (the Matti operation). The use of the nail offers no advantage, since an additional plaster cast or wire extension will be needed, and if the fracture becomes infected the nail would only add to the hazards.

FRACTURE OF THE TIBIA

Nailing osteotomy of obliquely healed fractures

A really stabile osteosynthesis in obliquely united fractures of the tibia is still more rarely obtained by osteotomy than is obtained in the nailing of fresh fractures, because the nail will only find a firm hold in the hourglass shaped marrow cavity, if the fracture is located in the middle of the bone. The smooth resected areas will afford no hold if pressed together and the nail will seldom find a firm hold in the callus that closes the fracture ends. If the cuts are applied transversely to avoid slipping off, it will always be necessary to resect a large piece of bone making shortening unavoidable. The smooth transverse fractures of the tibia have a tendency to form callus slowly, therefore, if no resection was performed to avoid shortening and if a gap is left between the abutments of the fracture there will be a still greater danger of delayed healing, although the osteosynthesis

*Figure 62a and b.**Figure 62c and d.*

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was stable in the beginning. The nail will gradually loosen in the bone, the fibula will heal early and a shearing of the smooth cuts is likely to develop which will seriously interfere with the healing process. It will be of little use to fill the gap with pieces of resected bone. This is illustrated by the case of a tibia fracture that had been nailed 2 months previously in another hospital (fig. 62a). Although the fracture was in good position, an angulation occurred because the nail was too short and the limb was subjected to weight bearing too early.

The patient was seen seven months after the nailing (fig. 62b); the nails were removed and, after a resection of the fibula, an attempt was made to correct the angulation by use of an osteoclast, but this failed. Eight days later an osteotomy was performed.

Figure 62c is a picture of the same fracture after osteotomy. The fracture cleft, which was still gaping in front and medially, was filled with bone chips. The fragments were in good position but it would have been better to use longer nails.

Four months after the operation (fig. 62d) the fracture cleft still was not healed and only filled with callus. It was stable from a clinical point of view and the patient did not complain of pain during weight bearing, but when the nails were removed, 4 weeks later, swellings were observed and the patient complained of pain; this subsided after 5 weeks.

If the cut is made on a slant it will be necessary to use a wire suture and plaster cast to avoid slipping and shortening. Thus the nail affords no advantage. Only by cutting the bone in the shape of a staircase can a wide contact of the fracture ends be obtained and at the same time avoid all longitudinal displacement. This procedure may appear relatively simple when tracings made on roentgenograms are viewed, but in reality it is a very complicated and tedious procedure and if satisfactory results are striven for, the operation presents many dangers of breaking sepsis.

It is far simpler to perform an oblique osteotomy and to unite the ends by wire suture after the removal of a corresponding wedge. This method will serve to correct the angulation and the shortening at the same time. A plaster cast is required in these and in similar cases when the marrow nail is used. In a 15-month-old closed leg fracture in which there was a recurvation, varus position, and a shortening of 2 centimeters (fig. 63a), plotting of the osteotomy line was made on the roentgenogram and at operation that part of the bone indicated by hatched marks was removed. After oblique osteotomy of the fibula and a resection of a wedge of the tibia (fig. 63b), the fragments were held in place by wire sutures. The shortening was corrected and the varus position as well as the recurvation

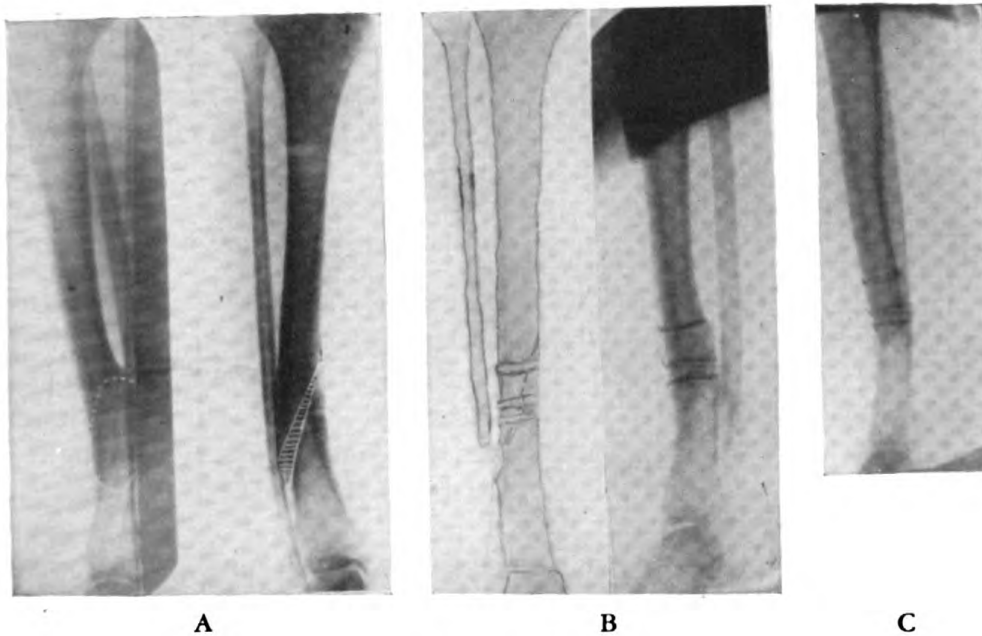


Figure 63.

was eliminated. Union was present 8 weeks after the operation and all joints were movable (fig. 63c). There was no shortening and the recurvation was negligible from a clinical point of view.

It is not easy for an inexperienced surgeon to determine the proper form of the wedge to cut after observing the roentgenograms in two planes, therefore it is recommended that a model of plastic material be prepared to correspond with the roentgenograms of the fractured leg and a resection made on the model before operating on the patient.

Guided by these experiences I do not use the marrow nail to correct obliquely united fractures of the tibia.

In the military hospitals the marrow nail was used five times for this purpose without infection developing. Two patients could not be observed until final healing; two cases were previously described; and in the fifth case the fracture did not unite for 6 months. This fracture, treated with a nailing operation, was located in the distal third. A plaster cast was necessary for 4 months and a shortening of 1 centimeter occurred.

The fracture illustrated by figure 63, treated with osteotomy and wire suture, healed so well that the patient was discharged after 8 weeks. The shortening was completely corrected and the joints were perfectly movable. Six other osteotomies of the tibia treated in the same way were hospitalized for from 36 to 98 days, an average of 56 days; unemployability for an average of 81 days. A permanent involvement of the joints was not observed in any of these cases and a shortening of 1 centimeter was noted in only one.

From a review of the foregoing cases it may be concluded that marrow nailing after osteotomy of obliquely united fractures of the tibia offers no advantage whatever, and in view of the dangers of the marrow nail in case infection occurs preference should be given the old methods of osteosynthesis.

Old ununited fractures and pseudarthroses

Apart from old fractures with faulty position and tibia fractures with deficient callus formation, pseudarthroses also require surgical intervention. The poor healing is, in the majority of cases (with the exception of infections), due to disturbed mechanical conditions, including inadequate fixation. If these mechanical disturbances are eliminated bony union of an old fracture of the tibia will be obtained in a majority of the cases.

In pseudarthroses, in which the ends of the bones are covered with a newly formed fibrous cartilage, it will always be necessary to expose the fracture site. In an ununited fracture, it is sufficient to resect the obstructing fibula and thus assure perfect abutment of the fragments (with or without Beck's drilling) and adequate position at rest. Healing will occur without exposure of the fracture site.

Our experience showed that it is not always possible to distinguish, with any degree of certainty, between a pseudarthrosis and an ununited fracture. The time elapsed since the original injury will not furnish any clues, nor will a roentgenogram be conclusive in most cases.

An osteosynthesis with a Lane's plate was performed on a tibia fracture 2 years prior to entering our hospital (fig. 64a). In all probability a piece of the fibula was not resected at the time, therefore, the osteotomy was gaping; the plate was loose because the screws were fixed only in one side of the cortex. The patient had been wearing a brace that was too wide so a modification was recommended. A year later the patient returned to the hospital for a final check-up (fig. 64b). Although the brace had not been changed, as was recommended, the fracture had united clinically and roentgenologically without a resection of the fibula, a Beck's drilling, or a bone graft. The brace prevented lateral movements and because it was too short it permitted the ends of the bones to be pushed together in an axial direction. The uniting of this fracture was possible only because we were dealing with nonunion and the bone ends were not covered with fibrous cartilage.

Bony healing may be expected in tibia fractures (up to 5 months old) if the fracture ends are well opposed (with or without Beck's drilling) and if a fixation of the fracture by a walking cast is assured. It is necessary, however (and this is often omitted),

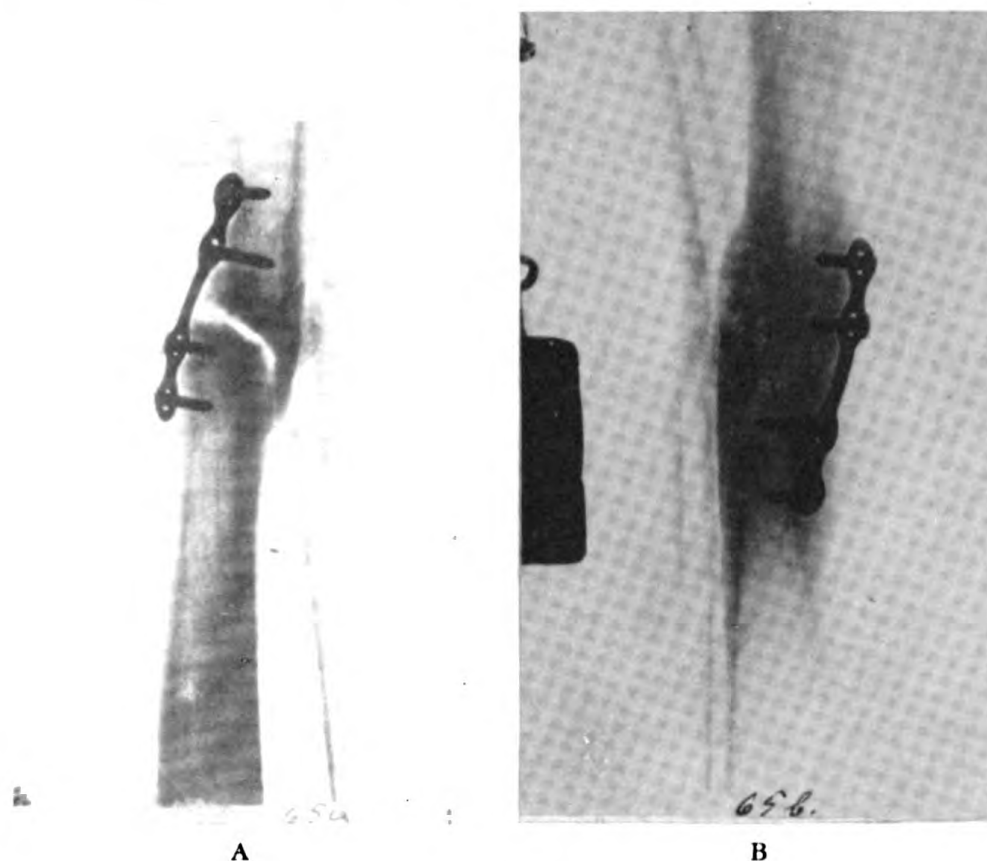


Figure 64.

to resect the obstructing fibula. The resection of a piece of bone 1 centimeter long is preferable to simple oblique osteotomy. The fibula heals so early in the latter instance that the bone will obstruct again.

If closed nailing can be done in such fractures (instead of using plaster cast) and if at least a relatively stabile osteosynthesis can be achieved, the patient will enjoy all the advantages of marrow nailing of fresh tibia fracture. It is not important whether it takes 6 or 16 weeks for bony union because the patient will have full use of the limb with the nail in position and his employability is only slightly reduced. The danger of infection is completely eliminated by the closed marrow nailing.

In 16 fractures of the tibia, that were from 4 to 23 weeks old, we used the closed marrow nailing method. All united without shortening and with free mobility of the joints, although considerable restrictions in mobility of the ankle joint in nearly all fractures more than 14 weeks old was noted before nailing. The stay in the hospital varied between 18 and 80 days, an average of 43 days, and unemployability lasted from 85 to 170 days, an average of 125 days. Similar results cannot be obtained without using the marrow nail.

The author is of the opinion that an attempt should be made to nail all old ununited tibia fractures suitable for nailing, without exposure of the fracture site, and the earlier it is done the better, taking contra-indications into consideration.

The resection of the already united or intact fibula will be necessary in all cases in order to thoroughly mobilize the fracture. If the shortening or lateral displacement is not too great, nailing can be performed in one stage together with the resection of the fibula, but if there is considerable displacement or shortening, or if the fracture is very old, a wire extension should be applied after the resection of the fibula, nailing postponed until the faulty position and shortening, particularly, have been corrected, and injury to the soft parts following mobilization of the fracture has healed.

In old or infected fractures the extension wire must be left in position until there is no danger of a sudden flare-up of the infection.

In deciding the advisability of nailing old compound fractures of the tibia when the closed nailing is not possible, it is necessary to determine if nailing offers any important advantages over other methods. (Fractures over 20 weeks old, and pseudarthroses are not suitable for nailing.) Even in the 26 cases of primary union the average stay in the hospital was 123 days and the period of unemployability averaged 178 days. These same results can be obtained by other methods. The average will be higher if infections are considered. Only 10 of the infected cases could be observed until final healing. The average stay in the hospital of these 36 patients was 245 days and unemployability averaged 273 days.

Seventeen (49 percent) of the aseptically united fractures showed no shortening or impediment of the joints; two cases resulted in a slight impediment of the ankle joint; four had a permanent impediment in the mobility of the ankle or knee joint; and in three pseudarthroses, bony union did not occur. All fractures complicated by infection showed stiff ankle joints and more or less pronounced impediment of the knee joint.

It must be admitted, therefore, that the results in open nailing of old tibia fractures, even in cases where there was an aseptic union, could not be considered superior to other methods. The danger of infection is ever present in this method and the nail adds to this hazard.

Death occurred in two patients with infected fractures. In the first case a transverse fracture of the middle of the tibia had been exposed after several unsuccessful attempts had been made to perform a closed nailing operation; the osteosynthesis was stabile. The patient developed fever 1 day after the operation and on the fifth day an abscess, where the nail was introduced, had to be opened. The wound at the fracture site healed primarily.

As the fever did not subside and because of the poor general condition of the patient a blood transfusion of 500 cc. was given on the twelfth day. Four hours after the transfusion the patient developed a chill with high fever which caused his death the next day. The post-mortem findings revealed: streptococcic sepsis with splenomegaly; liver and myocardial damage; and fresh septic infarcts of the lungs from metastatic foci in the tonsils. The patient had suffered from an acute angina while in another hospital, a fact which he had not mentioned.

The patient had a slight fever before the nailing operation, but this was overlooked because attention was centered on the fracture. Although the blood transfusion reaction can be considered as a contributory factor in the death, there is no doubt that the nailing also was a prime factor in activating the latent sepsis. The outcome of this case is the more regrettable since the position of the fracture was not poor and would have united by a conservative method. Death in this case occurred largely as the result of the surgeon's failure to carefully ascertain the general condition of the patient before the nailing operation was performed.

In the second death the nailing was also indirectly responsible for the outcome.

An open marrow nailing was performed on a 10-month-old fracture of the tibia because the fracture was still movable 2 months after the osteotomy of the fibula (fig. 65*a*). A necrosis of the skin developed which resulted in infection of the fracture. As only one thin nail was used the osteosynthesis was not stabile (fig. 65*b*) and a slight

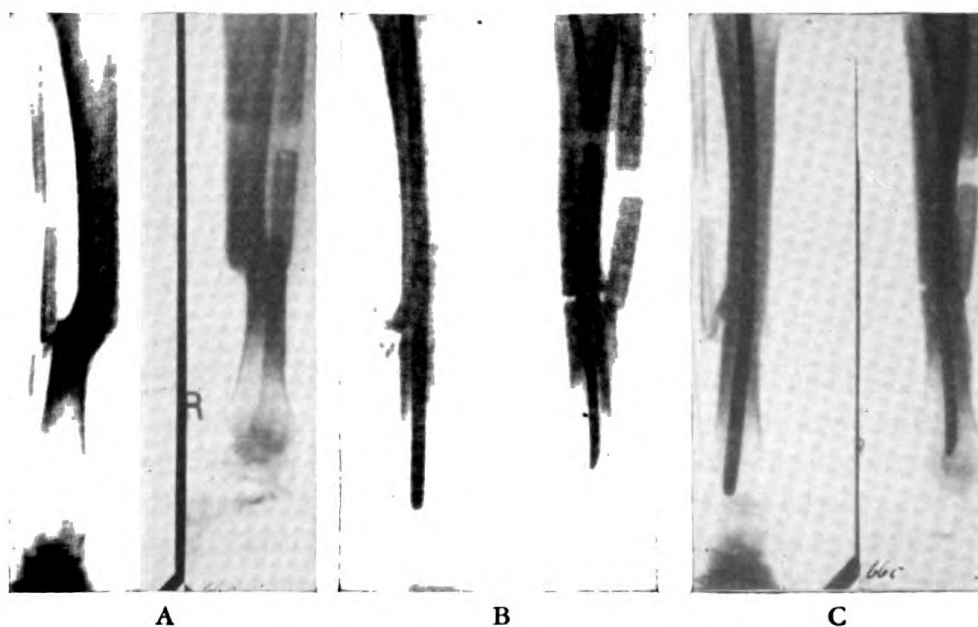


Figure 65.

valgus position developed, in spite of the fact that the leg had been put in a splint. When the fracture was clinically united and the fistula showed very little secretion (fig. 65*c*), the nail was removed. In an effort to obtain a firmer hold for the nail the intensely stiffened knee joint was mobilized. An empyema of the knee joint developed which was drained by resection of the condyles. A new abscess developed at the fracture site which led to sepsis and death because of the failure to amputate soon enough. At autopsy, empyema was found in the ankle joint. This infection had spread by way of the path of the nail and developed after the nail was removed because the nail had been driven in too far beyond the line of growth, almost to the cartilage of the ankle.

In this case, as in the first, the position of the fracture was not poor and union could have been obtained without the use of the nail, had there been adequate immobilization. The rules of general surgery were disregarded, for it is strictly prohibited to forcibly mobilize a stiffened potentially infected joint because of the serious hazard of infection to the joint.

As has been previously mentioned there were no stabile osteosyntheses in nearly all infected cases so the results are quite different if viewed from this angle (table 8).

TABLE 8.—*Open marrow nailing in aseptic¹ old tibia fractures and pseudarthroses*

	Num- ber of cases	Average number of days in hos- pital	Average number of days unem- ployable	In- fected	Result ²			
					I	II	III	IV
Osteosynthesis, stable.....	15	53 (31-96)	108 (85-193)	2	13	1	-----	-----
Osteosynthesis, not stable.....	³ 21	221 (136-368)	248 (136-380)	19 (61%)	{ Primary union 4 | 1 | 4 | 2 Infected 2 | 1 | 7 | -----			

¹ Open, previously infected fractures, the wounds of which had healed more than 8 weeks before, are included in the aseptic fractures. Old fractures due to gunshot injuries are not included.

² I. Healing without shortening, angulation, or impediment of the joints. II. Slight angulation, shortening, or impediment of the joints. III. Marked angulation, shortening, or impediment of the joints. IV. Pseudarthroses.

³ 10 not observed until fracture united.

It is evident from the results shown in table 8 that the danger of infection due to marrow nailing is very slight in cases of stabile osteosynthesis and results are better than could possibly be achieved by other methods. The stay in the hospital was generally shorter and impediments of the joints were avoided and existing ones relieved or corrected because the patients could begin exercising movements early. In cases of insufficient stability, however, the infection rate was very high (61 percent), the treatment very long, and the results very poor.

To a large extent infection was responsible for the poor results. The fractures had to remain in plaster casts for a long time because of infection and therefore considerable stiffening of the foot, and sometimes the knee joint, resulted. Intense angulations or shortening could have been avoided because the fractures were not put under stress too early.

The cases of aseptically healed fractures grouped under Result III of table 8 refer to marked angulation which was present after the nailing and was unnoticed or else the patient was permitted to use the fractured leg too soon; no attention was paid to the gradually increasing angulation.

Stability gains special importance in pseudarthrosis, which according to our definition includes all fractures older than 6 months regardless of whether there is pseudarthrosis or nonunion.

A few examples of this are as follows: A 24-week-old fracture of the distal third of the tibia was treated by closed nailing and simultaneous resection of the fibula. The osteosynthesis was stabile, a bony union achieved, and the nail withdrawn in 5 months.

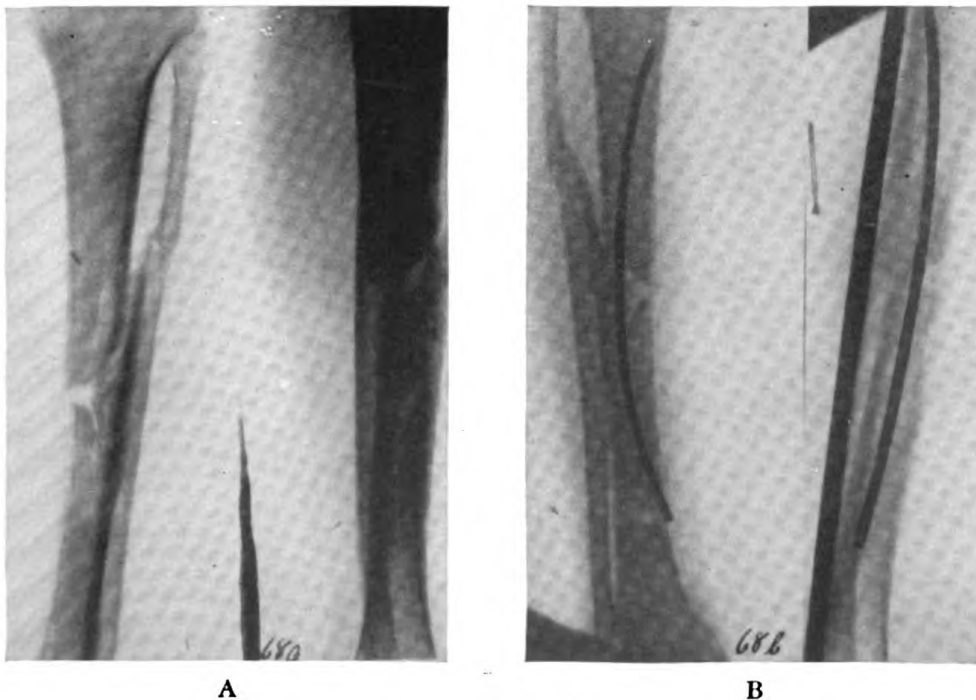


Figure 66a and b.

In a 26-week-old fracture (fig. 66a) the fibula was not resected and only one thin nail was introduced from the distal side without opening the fracture (fig. 66b). After 11 months the fracture had not united (fig. 66c) because the thin nail had no grip and could not prevent the lateral and tilting movements and because the fibula had not been

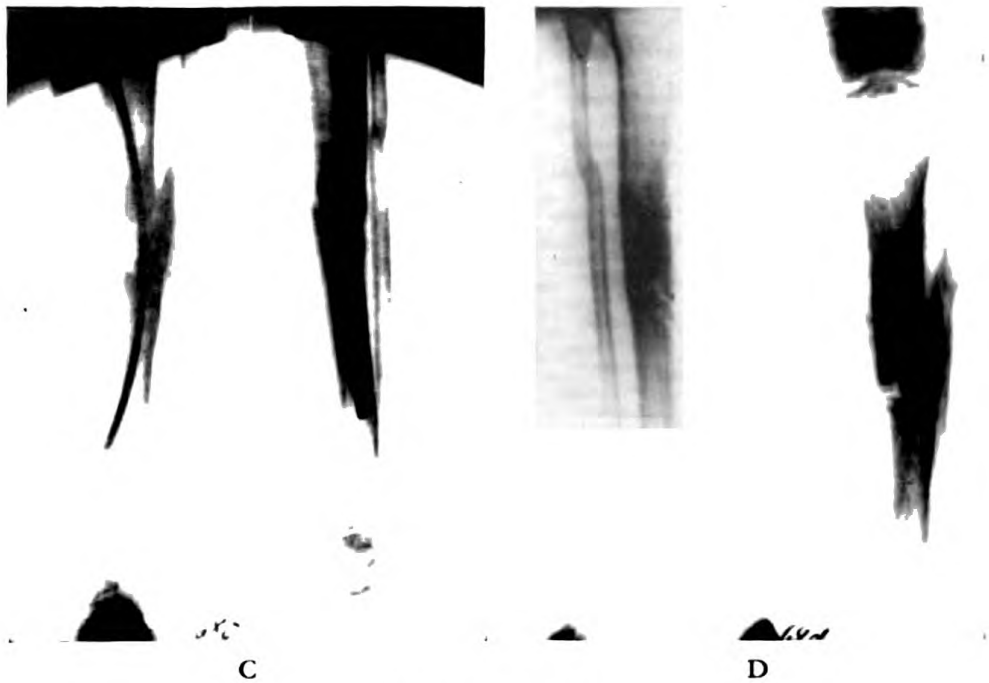


Figure 66c and d.

resected. The nail was removed, an osteotomy of the fibula performed, and a bone graft was performed (fig. 66d). The fracture united 8 weeks later. A simple resection of the fibula without nailing would probably have been simpler in this case and union of the fracture more quickly obtained.

In an ununited 10-week-old fracture (fig. 67a), in which the marrow cavity was closed by eburnated bone and the fracture cleft filled with connective tissue, the marrow cavity was opened only wide enough to allow the nail to enter. The osteosynthesis was stabile (fig. 67b) and

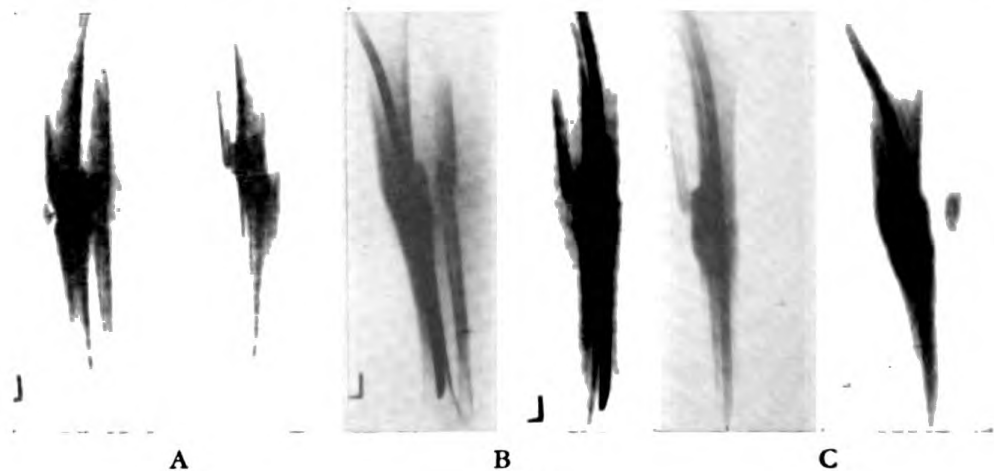


Figure 67.

the patient could walk without a cane 4 weeks after the operation. Five months after the operation the fracture had united, all joints were freely moveable, and the patient discharged from the hospital.

A 7-year-old pseudarthrosis (fig. 68*a*), in which the scar tissue that filled the fracture cleft was removed only from the anterior part, the marrow cavity was opened only wide enough to introduce the nail. The gap caused by the removal of the scar tissue was filled with bone chips. The patient was able to use the leg 4 weeks after the operation and was drafted for labor service 8 weeks post-operatively.

Three months post-operatively the patient was unable to walk, because of pain, and he was then put to bed for 4 weeks. Four months after the operation (fig. 68*b*) there was no callus formation and a



Figure 68*a*.



Figure 68*b*.

lateral roentgenogram revealed slight rarefactions that indicated the nail was loose. The nail was withdrawn with the expectation that a callus would form in the nail path. After 3 months with a walking cast the fracture united.

The withdrawal of the nail was unnecessary. The fracture would have united if only a plaster cast had been used; the instability was probably responsible, to a certain extent, for the delayed callus formation. In an old pseudarthrosis, such as this case, all scar tissue should have been removed or the gap filled with the spongiosa as in Matti's operation. The removal of the nail cannot be expected to have a stimulating effect on callus formation comparable to Beck's drilling, because no new bone wounds are created.

A pseudarthrosis several years old with stabile osteosynthesis will heal without grafting of spongiosa if the faulty tissue is carefully removed. This was proved in the case of a 3-year-old pseudarthrosis of the tibia, after compound leg fracture (fig. 69a). Two years previously the fibula had been resected and an unsuccessful Beck's drilling had been made. The shortening was 3 centimeters. At operation the ends of the bone were found connected by sturdy con-

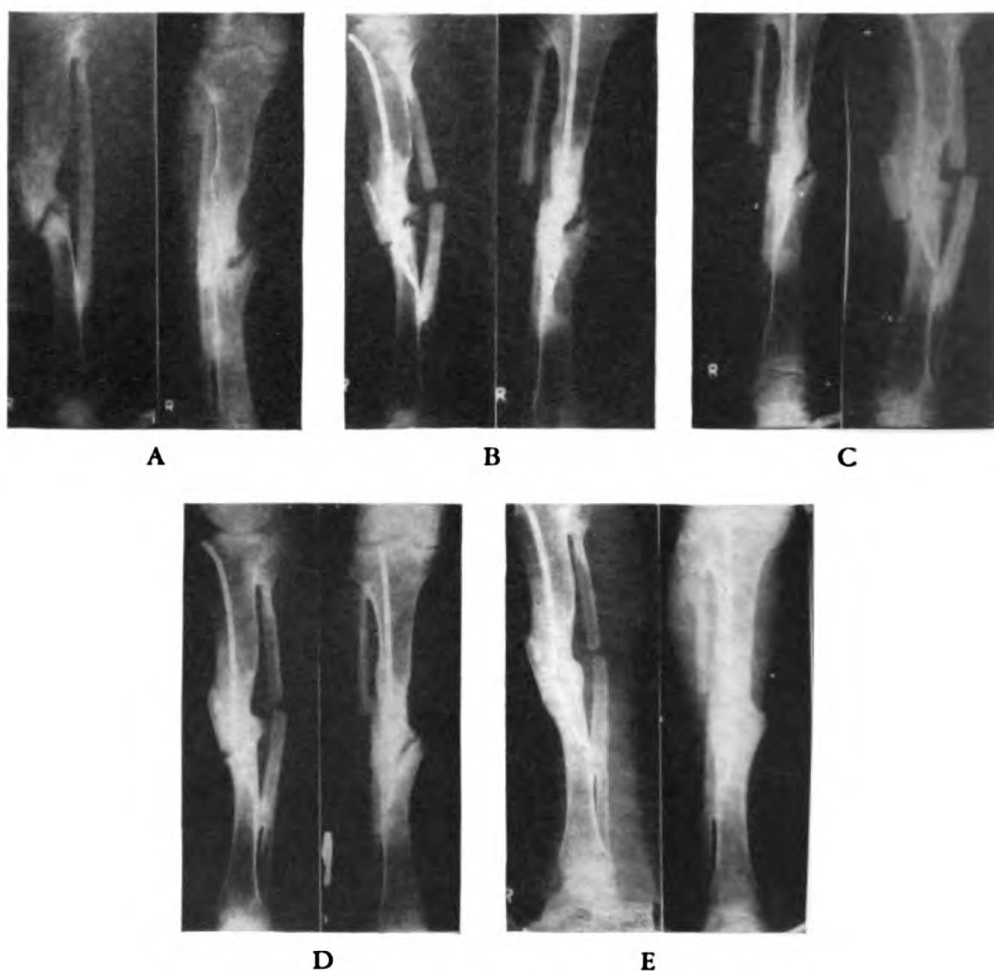


Figure 69.

nective tissue, and were partly covered with a fibrous cartilage. In order to prevent further shortening the faulty tissue was carefully removed from the bone ends until fresh bone was exposed. The marrow cavity was not opened because it was difficult to locate with Kirschner wires under x-ray control. A canal for the nail was then made by piercing through the hard callus. Inserting the nail presented several difficulties: The fracture had to be fixed in a strong recurvation first and then bent into position. The nail became S-

shaped by these manipulations and soon touched the posterior cortex to which it became so firmly engaged that the nail could not be driven in any further and so had to be cut off. The fracture became fixed after the operation (fig. 69*b*). The patient wore a light plaster cast for the next 8 weeks because only a thin nail had been used and although roentgenogram (fig. 69*c*) showed a distinct callus formation, he wore a hinged brace apparatus for another 3 months. Five months after the operation the fracture was bridged over by callus (fig. 69*d*) and the patient was able to walk without a brace for long distances. He was drafted into the military service and returned 4 years later to have the nail withdrawn. The fracture was well united (fig. 69*e*). The nail could not be withdrawn, because of its S-shape and it could not pass through the small canal in the callus. The blood picture

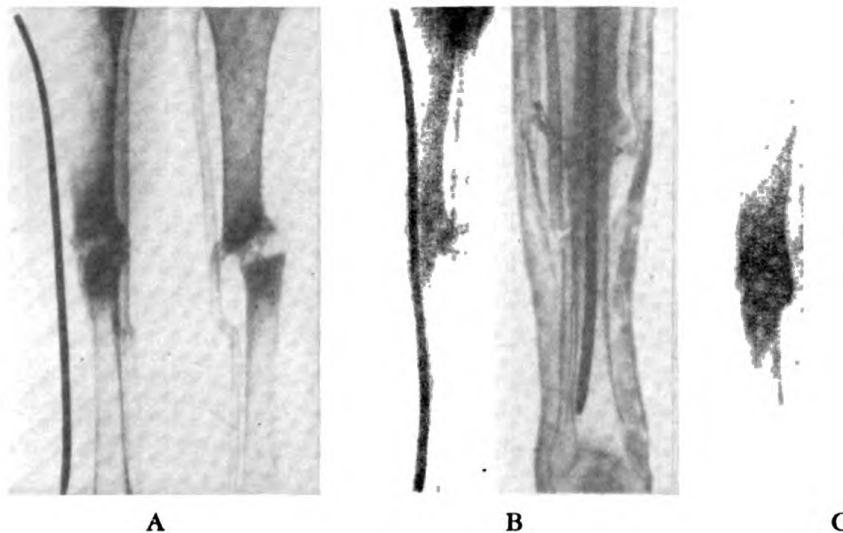


Figure 70*a*, *b*, and *c*.

revealed no changes and the patient had had no trouble. The leg was still 3 centimeters short and rotation of the ankle was reduced to one-fourth of normal. Flexion and extension were normal. As the patient was only 28 years old it was proposed to shorten the femur of the sound leg by 3 centimeters; using a marrow nail. This operation had not been performed at the time of writing.

The operation on another 3-year-old pseudarthrosis (fig. 70*a*) presented similar difficulties. The fracture cleft was filled with connective tissue but fibrous cartilage was not observed. Although double nails had been used, they were too short and the fracture was still readily movable. The nails should have been driven into the spongiosa as far as the line of growth. A U-shaped splint was at first applied and worn for 2 weeks. The fractured limb could then be used and the patient was discharged. He continued wearing his hinged brace

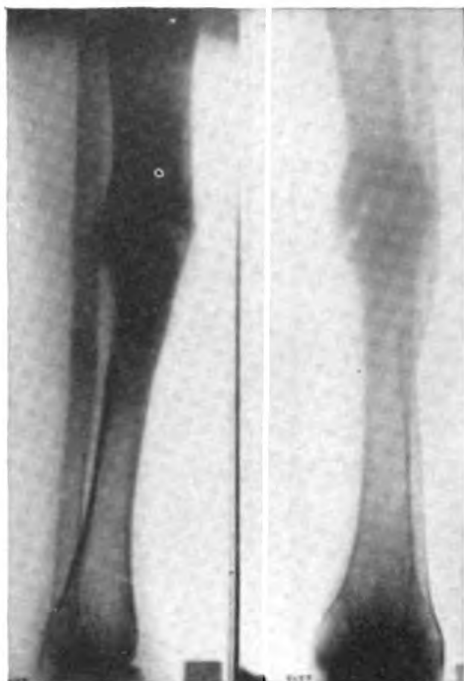


Figure 70d.

apparatus for some time. After 6 months, when the nail was removed, fixation of the fracture appeared complete; figure 70c, however, shows the fracture cleft clearly visible. The patient, who returned 3 months after the nail was removed, complained of pain and swelling at the fracture site. Clinically a slight springiness of the fracture was observed and we suggested a resection of the fibula, to which the patient would not consent. The patient returned again 4 years after the operation. A persistent slight elasticity of the fracture was observed, and roentgenogram (fig. 70d) showed a fracture cleft. This was a tight, apparently a connective tissue,

union. The reason for the faulty union was that osteotomy of the fibula was done instead of resection, which was necessary. From observation of the roentgenogram, resection of the fibula would have permitted union of the fracture, but the patient again refused to permit the operation because the nonunion of his fracture kept him out of military service and would also save him from undesirable work.

The faulty union was due to technical errors (premature removal of the nail and failure to resect the fibula) and could have been avoided. If the surgeon endeavors to prevent a shortening by avoiding an extensive resection of the bone, locating the marrow canal and making provision for a path for the nail in the hard callus will present considerable difficulty, and make tedious manipulations necessary, thus increasing the danger of infection. There is no guarantee that a stabile osteosynthesis will be achieved by the use of a simple marrow nail, and the use of a spread nail will make the operation more complicated, therefore, we do not nail when conditions are adverse. We prefer a bone graft in addition to resection of the fibula. The disadvantage of a plaster cast is compensated for by the greater security of a united fracture and if a light walking cast is used the danger of stiffening of the joints is very slight.

To be continued in the November-December issue of the BULLETIN.



Bronchogenic Carcinoma

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CANCER of the lung is one of the two most frequent types of malignancy encountered in men; this and cancer of the stomach make up an average of 20 percent of all malignancies in men. Whether or not the frequency of this condition is increasing is a matter of debate; when there is a more universal awareness of the entity, and when standardized methods of diagnosis are more widely and intensively used, more cases of bronchogenic carcinoma will be discovered. Previously many of these cases were diagnosed as pneumonia, lung abscess, brain tumor, or cerebral accidents.

The etiology of bronchogenic carcinoma has been the subject of much study and, except for a few instances where working conditions have been shown to have a very definite influence as a causative factor, no definite cause is known. It is a disease primarily of males; 80 to 90 percent of all bronchogenic carcinoma occur in men. The age incidence is very important and the diagnosis of this condition should be entertained in all male patients with cough or hemoptysis in the fourth decade or beyond. Table 1 shows the age distribution in the authors' series of 26 cases.

TABLE 1.—*Age incidence of cases of bronchogenic carcinoma*¹

Age (years)	Number of cases	Percent of total
Over 70.....	1	3
60 to 69.....	5	19
50 to 59.....	15	57
40 to 49.....	5	19

¹ Oldest patient 71 years old; youngest patient 43 years old.

Pathologic classification of the type of cell found varies with the pathologist to some extent, but the types usually decided upon are: squamous cell, adenocarcinoma, and undifferentiated or anaplastic carcinoma. In our series there were 15 cases of squamous cell type, 3 of adenocarcinoma, and 8 of undifferentiated or anaplastic carcinoma. There were no cases where the bronchoscopic biopsy or the metastatic

lesions differed from the specimen taken from the lung at surgical removal or autopsy.

The symptoms of bronchogenic carcinoma may resemble those of any of the more common respiratory diseases (table 2). Unfortunately, patients with cough, chest pain, hemoptysis, dyspnea, and weight loss have been treated for prolonged periods without adequate study. All these symptoms may not be present at the onset of the disease, when chances for resection are highest; in fact, by the time all these symptoms become prominent, even palliative surgery may be impossible. At present with mass roentgenographic surveys the diagnosis should be made more often because of positive roentgenographic findings, rather than because of symptoms. (These patients usually have some symptoms, but they are frequently not severe enough to cause them to seek medical advice early.)

TABLE 2.—Incidence of symptoms in cases of bronchogenic carcinoma

Symptoms	Cases	Percent
Cough	23	92
Chest pain and/or dyspnea	17	65
Hemoptysis	13	52
Weight loss	14	56
Back pain	3	12
Central nervous system symptoms	2	8

Physical findings in the early stages of the disease are few. They depend on the degree of occlusion of the involved bronchus and on the consequences of this occlusion. One of the early physical findings is a wheeze on deep expiration caused by narrowing or distortion of a bronchus. It is accentuated when the patient lies on the affected side. With increasing occlusion, there is interference with the normal cleansing mechanism and pneumonitis, pneumonia, or lung abscess may occur. Complete occlusion results in atelectasis. Occasionally there may be an area of trapped air due to ball valvelike action of a kinked or partially occluded bronchus.

In a man over 40 years of age the presence of pneumonia which does not respond adequately to present methods of treatment in a reasonable period of time should be further studied with a view to ruling out carcinoma. Lung abscess should also be looked for and treated surgically at the most opportune time, since, in this age group, it is frequently associated with cancer. The incidence of lung abscess in our series was 4 cases, or 15 percent of the 26 cases.

Certain valuable, though not infallible, diagnostic methods are available, such as:

Roentgenogram of the chest.—This usually gives the first evidence of serious disease (table 3). At times, the findings are not clear-cut and difficulty arises in the interpretation. Atelectasis is the most

common finding, and should arouse the greatest suspicion; 12 of our cases, or 48 percent, showed this finding. Unilateral hilar enlargement is another very suggestive finding, as are areas of pneumonic infiltration which fail to clear with ordinarily effective therapeutic measures. As stated before, lung abscess is also found, sometimes quite discrete, but at other times associated with extensive infiltration.

TABLE 3.—*X-ray findings reported*¹

Findings	Number of cases	Percentage
Atelectasis.....	13	50
Infiltration.....	7	27
Lung abscess.....	4	15

¹ 2 cases were terminal on admission and x-rays not taken.

Bronchoscopy.—Various authors report that from 60 to 75 percent of bronchogenic carcinomas are accessible to the bronchoscope (table 4). This is a relatively easy and painless procedure when properly done, and should be recommended without hesitation in any suspicious case. When a suspicious lesion is seen, removal of a specimen for biopsy is possible in a high percentage of cases. Certain strongly suggestive conditions may be observed such as: distortion, stenosis, or displacement of the bronchus. Bronchoscopic examination was done in 17 of our cases and of these, 13 showed suspicious lesions. Specimens for biopsy were taken in 11 or 64 percent of the cases.

TABLE 4.—*Bronchoscopic examinations*¹

Findings	Cases	Percentage
Positive findings (tumor seen or suggested).....	13	² 76
Specimen removed for biopsy.....	11	² 64

¹ Bronchoscopic examination in 17 or 68 percent of cases.

² Percentage of 17 cases.

Smears.—Excellent results have been reported on studies of sputum smears and those of bronchoscopic aspirations and washings when stained by the Papanicolaou technique. The method has not been used extensively in our series but we believe that when properly done it has a place in the diagnosis of malignancy. In ruling out tuberculosis a series of negative smears is sufficient when other diagnostic studies indicate malignancy. It must be remembered that bronchogenic carcinoma can arise in a lung previously infected with tuberculosis.

Thoracentesis.—Examination of the fluid obtained from chest tap occasionally reveals the presence of tumor cells. A positive result obtained by this method usually rules out the possibility of cure.

Bronchography.—This procedure has a very limited usefulness in the diagnosis of this disease. One case in our series showed an obstructed, nonfilling bronchus following recovery from a lung abscess. This led to the surgical removal of the smallest lesions in the series.

Needle biopsy.—This procedure is usually condemned, except possibly in the obviously inoperable cases where a histological diagnosis is desired before beginning palliative therapy.

Biopsy of nodes.—Enlarged nodes should be removed and examined to rule out metastatic lesions; where biopsy shows malignancy, the possibility of resection is remote, and the prognosis is very poor. Five of our cases were diagnosed by biopsy of cervical lymph nodes.

Thoracotomy.—In many instances this is the most valuable procedure in making a diagnosis particularly in cases of "coin shadows," to differentiate between lung abscess, tuberculosis, and carcinoma. The studies of Lindskog (1) illustrate the value of this procedure. Thoracotomy was done in 32 out of 100 cases; of these, 20 had not previously shown a positive biopsy. In 10 of the 12 cases where resection was possible, no pathologic diagnosis had been established prior to operation. The value of early exploration, from a diagnostic and therapeutic standpoint, is thus well shown. The operation, as such, carries a negligible mortality and should be used where other methods fail to either establish or rule out malignancy.

Pulmonary function.—Studies to establish the percentage of respiratory function is of no aid in the diagnosis of malignancy, but is of importance to establish the efficiency of the remaining lung tissue. It must be stressed that at the present time we do not know the minimal amount of functioning lung required for safe recovery after pneumonectomy.

Resections for bronchogenic carcinoma are usually considered as only palliative; to provide relief from pain, from toxicity of a putrid lung abscess, or from the severe hacking cough of a partially occluded bronchus. Death usually occurs as the result of distant metastases, and not by enlargement or extension of whatever cancer tissue may be left in the thoracic cavity.

Of the 26 cases of bronchogenic carcinoma, 9 were subjected to operation; of these, resection was possible in 6 (4 pneumonectomies, 1 lobectomy, and 1 segmental resection). There were no deaths resulting from the operations. An interesting fact is that during the 4 years included in this study only 26 cases of bronchogenic carcinoma were found in the hospital records, and of these, 18 were admitted in the past 1½ years and all the resections were performed in this past 1½ years (table 5).

TABLE 5.—*Cases of bronchogenic carcinoma reported in the literature from the various naval hospitals*

Hospitals	Cases reported	Cases operated	Cases resected	Surgical deaths
USNH, Philadelphia, January 1937–August 1939 (2)	30	8	5	4
USNH, Philadelphia, January 1941–October 1942 (3)	31	6	0	1
USNH, Long Beach, 1943–47 (4)	24	3	0	0
USNH, St. Albans, 1944–July 1948	26	9	6	0
Total	111	¹ 26	² 11	³ 5

¹ 24 percent.² 42 percent of those operated on.³ 19 percent.

SUMMARY

1. Bronchogenic carcinoma should be suspected in any person over the age of 40 with symptoms of chronic cough, hemoptysis, nonresolving pneumonia, or lung abscess.

2. Bronchogenic carcinoma should be ruled out in cases of brain tumor and cerebral accidents in men over 40 years of age.

3. Bronchoscopic examination can be expected to show a definite or suspicious lesion in about 70 percent of bronchogenic carcinomas. Removal of specimen for biopsy can be done in about 60 percent.

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Carcinoma of the Cervix Uteri

WILLIAM S. BAKER, *Commander (MC) U. S. N.*

PATHOLOGICALLY carcinoma of the cervix uteri appears in two forms: (a) An epidermoid or squamous cell type made up of surface epithelium; and (b) an endothelial or glandular cell type more frequently referred to as adenocarcinoma. Martzloff (1) reported an incidence of 94.5 percent squamous carcinoma and 5.5 percent adenocarcinoma and to the author's most recent knowledge this ratio still stands.

Clinically, carcinoma of the cervix appears in two varieties; an invasive form, which has been recognized clinically for many years, and a noninvasive intra-epithelial form or carcinoma in situ first recognized by Pemberton and Smith (17) in 1929 and again three years later by Schiller (2) of Vienna. The noninvasive cancer, as its name suggests, is made up of surface epithelial elements and is considered to be the very earliest form of malignancy to manifest itself for laboratory diagnosis. The criteria for diagnosis of this condition consist essentially of a definite change in the appearance of the individual cell and its relationship to its neighboring cells. The orderly progression of cells from the basal layer to the surface is lost and intracellular changes occur, denoted by large and deeply staining nuclei and evidence of accelerated mitoses. These changes in the individual cell indicate a cancer of the noninvasive type. This should be treated according to the method considered best suited for the complete eradication of the disease (3) (15) (16).

From the standpoint of the pathologist the invasive carcinoma is graded according to the criteria advanced by Broders (4). A grade of 1 to 4 is assigned in accordance with the amount of differentiation in cellular architecture present in the field examined. This classification is not to be confused with the clinical staging of a malignant lesion (5). The latter depends upon the interpretation by the examiner of the extent of advance of the disease and as a consequence is subject to considerable error.

INVASIVE CARCINOMA OF THE CERVIX

The patient with a possible cancer of the cervix usually has borne a child and is over 35 years of age. However, there are exceptions to this observation. A survey made by the Public Health authorities of the State of Massachusetts and recently quoted indicates that 2.5 percent of all parous women over the age of 35 will develop cancer of the cervix.

Robert J. Crossen (15) in a recent article quoted the following statistical data.

Craig found that in 2,895 cases of cervicitis treated adequately and then followed for a period of ten years or more, not one patient developed cervix cancer. Karnaky reporting statistics from the Jefferson Davis Hospital found that in the preceding ten year period there were over 5,000 conizations. In the same period there were 709 cervical cancers. Not one cancer developed in a conized cervix.

Thus it is seen that the elimination of benign cervical conditions will definitely decrease the incidence of cancer of the cervix.

The usual history of patients presenting themselves for examination is of bleeding that occurs not at the time of menstruation but following some form of trauma usually a douche or intercourse. This contact or postcoital bleeding must be considered as evidence of a possible malignancy until proved to be otherwise. Upon doing the examination the examiner should insert the speculum into the vagina very carefully, in order not to traumatize the cervical epithelium and thus confuse the picture. After the speculum is in position the cervix is scrutinized thoroughly for evidence of new growth. The latter may be a small erosion that bleeds easily on contact or may be an actual papillomatous lesion that bleeds easily when touched. The cervix may appear to be innocent, but when palpated it feels hard and indurated. This may be a lesion of the invertants type. At any rate all such abnormalities of the cervix must be considered malignant until a biopsy proves otherwise.

The next step in the examination is to take a vaginal smear before the cervical and vaginal epithelium has been traumatized by the examiner's finger or a cotton applicator. This is done in accordance with the method described by Ayre (6). Using a wooden spatula, the cervical epithelium at the squamocolumnar junction is scraped away with a circular motion; for it is believed that cancer of the cervix arises at this point (18).

In the laboratory the smear is stained by the method of Papanicolaou (7) and then interpreted by the pathologist according to the criteria laid down by Papanicolaou and Traut (8). To date, 600 smears have been taken in the Gynecology Section of the Clinic; 1 percent have been reported positive for cancer.

After taking the smear the cervix is carefully wiped clean with a cotton applicator and the Schiller Tinctorial Test is applied. This consists of painting the cervix and adjacent vaginal mucosa with Lugol's solution and noting any failure of the iodine to stain the cervical epithelium. The interpretation of the test rests upon the fact that normal epithelium contains a certain amount of glycogen and will stain a deep mahogany with Lugol's solution. Any break in the continuity of the epithelium such as an erosion, ulceration, or traumatized area will not take the stain as deeply as normal tissue. This is also true of an area infiltrated with carcinoma. Therefore the value of the test is its ability to point out where to take a specimen for biopsy and nothing else. This diagnostic procedure has not been utilized much in recent years because of its many limitations (18) but it is felt that it deserves routine use in a large clinic.

A patient with invasive cancer of the cervix may present the following findings depending on the clinical extent of advance of the lesion: (a) The cervix itself may feel firm and indurated either in whole or in part and the remainder of the pelvic structures may feel normally soft and relaxed and freely movable. This is called a Stage I League of Nations' Classification as the lesion is clinically limited to the confines of the cervix (5); (b) if the brawniness and induration is also felt in the paracervical ligaments and appears to involve the upper third of the vagina, the lesion is considered to be Stage II, as it has gone beyond the confines of the cervix into the parametrium and upper vagina but has not as yet involved any pelvic glands. Stage III is represented by the findings in Stage II plus definite induration in the broad ligaments and palpable pelvic lymph nodes. The combination of Stage III findings with invasion of the rectum and/or bladder plus distant metastasis elsewhere constitutes League of Nations' Stage IV. Another classification in use in various centers is the Schmitz Classification. It differs from the League of Nations' Classification by dividing Stage I into two parts and then combining Stages II and III; the Schmitz Classification is perhaps the better of the two because of its attempt to subdivide more accurately lesions confined to the cervix. At any rate either classification is permissible but the examiner should choose one classification and use it routinely so as not to create confusion in the further management of the case.

Before concluding the pelvic examination we usually perform one more diagnostic procedure; the Clarke Test. It is done by inserting a probe very carefully into the cervical canal and if bleeding occurs it may indicate the presence of an adenocarcinoma of the endocervix or endometrium. Such cases should be hospitalized for diagnostic dilatation and curettage and removal of a specimen for biopsy from the cervix.

Following the pelvic examination the next step is the removal of a specimen for biopsy from the cervix. A regular biopsy forceps is used for this procedure and if no visible lesion is present on the surface of the cervix a representative section of the portio vaginalis and endocervix is removed at 12, 3, 6, and 9 o'clock. In this manner, it is considered by most authorities (18), that the majority of cancers will be detected. Troublesome bleeding is controlled by coagulants or electrocoagulation. In some cases it has been necessary to bring the patient into the hospital, stop the bleeding with ligatures, and replace the blood loss by transfusion. However these cases are few and we feel that anyone doing this type of work must expect to encounter occasional bleeding and must be prepared to deal with it when it occurs.

With all the preliminary work completed we await the biopsy report. If invasive cancer is reported a course of radiotherapy is prescribed and begun immediately. If intra-epithelial cancer is reported, the patient must be hospitalized for a complete conization biopsy of the cervix before any treatment can be contemplated.

In order to prevent any confusion in the discussion on treatment of invasive cervical cancer we shall only consider treatment by irradiation utilizing both radium and high voltage roentgen therapy. This does not mean that surgery has no place in the management of this condition; until surgery is proved to be more beneficial from the standpoint of 5-year survivals it is generally conceded that irradiation is the treatment of choice.

For many years the problem of the correct amount of irradiation to be delivered to the tumor area and what constitutes a cancerocidal dose has been the subject of investigation by many workers in the field of radiotherapy. Various methods of radium application have been devised but only a few have stood the test of time. The problem has been the delivery of sufficient roentgens to effectively eradicate the cancer without producing irreparable damage to normal intervening tissue. This has been partially accomplished by most radium treatment centers but is still on an empirical dosage basis; for there still remains a definite unknown factor in the equation. This latter element, it is now felt by most physicists, can be accurately measured, thereby enabling the therapist to actually plan a curative dose in terms of roentgens and then deliver that amount of irradiation to the cancer-bearing area. Such a system of planned dosage is being used at the Holt Radium Institute in Manchester, England. It was first described in the literature by Tod and Meredith (9) in 1938 and is known as the Manchester System of Radium Dosage. Since that time it has been used quite successfully by the Manchester Group in the treatment of cervical cancer. They have recently reported a 5-year

survival rate of 70 percent in patients with Stages I and II (League of Nations' Classification) lesions.

The system depends essentially upon knowing how much irradiation is needed to eradicate cancer cells at a given vulnerable point in the pelvis designated "A" without producing radiation necrosis in normal intervening tissue, and then actually delivering such a dose.

According to Tod (10) this optimum dose was determined to be in the neighborhood of 8,000 gamma roentgens; in January 1941 she described the manner in which such a figure was arrived at in her monograph on the subject. This dose is considered to be cancerocidal when delivered to point "A" utilizing both radium and high voltage roentgen therapy. Point "A" is defined as that location in the paracervical triangle at which the uterine artery crosses the ureter. It is 2 cm. lateral to the cervical canal and 2 cm. superior to the lateral vaginal fornix. It is also in this vicinity that the major blood vessels supplying the lower half of the pelvis originate and, as pointed out by certain investigators, they are especially vulnerable to over-irradiation.

Three quarters of the total dose at "A," or 6,000 gamma roentgens, is delivered in half by the vaginal colpostat or special ovoid applicators and in half by the intrauterine tandem arrangement thereby eliminating an overdose to intervening normal tissue. This is accomplished in two parts but still within an over-all 10-day period.

The total dose is obtained by augmenting the 6,000 gamma roentgens at point "A" with 2,000 R calculated at the depth of the broad ligaments and delivered through four pelvic ports; two anterior and two posterior with a 4 cm. area between to afford protection to the bladder and rectum. Thus point "A" receives a total of 8,000 R—a cancerocidal dose.

It may be well to note here that the total milligram hour exposure time in this system cannot be converted into that of another system without referring to certain radium dosage tables devised for this purpose.

We use a modification of such a system here as we do not have the special applicators designed for the technique by the Manchester Group. In place of the vaginal ovoids we use the Curie Colpostat. Also our radium is contained in capsules made of silver with a filtration equivalent to 1 mm. of platinum and are enclosed in an ordinary rubber tube, not in the thin rubber tandem arrangement described by Tod and Meredith. Nevertheless, by referring to the radium dosage tables for linear and point sources of radium as worked out by Quimby (11), we can calculate the required milligram hours needed to deliver a cancerocidal dose to point "A." Thus we may speak interchangeably

of tumor depth dosage in roentgens or the equivalent milligram hour exposure time in each individually precalculated case.

Before we start our plan of therapy we must decide if the cancer is amenable to cure. If it is a League of Nations' Stage I, or a Stage I or II Schmitz we can consider it to be curable providing it is not a radio-resistant tumor. Twenty percent of these tumors are of the radio-resistant variety and as a result do not respond well to radium and high voltage roentgen therapy. This group, it is conceded, should be offered radical surgery as the only means of effecting adequate treatment.

Read (12) of Great Britain has recently reported on the surgical approach to this problem using the statistics compiled by Victor Bonney. In a series of over 400 Wertheim procedures over a period of 40 years it has been determined that 25 to 35 percent of Stage I lesions are actually Stage II. These are the cases that have the best chance of a cure with surgery. Once the pelvic glands are involved, irradiation, at present, can offer no cure.

Finally deciding we have a Stage I League of Nations' case with a Broder's grading of say 3 we plan our course of treatment. The patient is referred to the X-ray Therapy Division with a request that 2,000 R be delivered to the parametrium and broad ligaments at that depth through 4 pelvic ports as previously described. Within a period of 2 weeks, after receiving the precalculated roentgen dosage, the patient is hospitalized for dilatation and curettage and radium insertion. Knowing it will be necessary to deliver 6,000 gamma roentgens to point "A" to satisfy our original requirements for a cancerocidal dose we proceed in the following manner. A urinalysis and complete blood count are done and if there is any doubt as to the status of the kidney function, renal function tests are done. Enough radium is placed intrauterine in tandem and in colpostat so that one half of the tumor depth dose is derived from both sources. From standard dosage tables we calculate the total milligram hours exposure time necessary to deliver our dose in roentgens to point "A." This has been determined to be approximately 7,000 milligram hours in most cases. The radium is then placed in position as previously described and the bladder and rectum are packed well out of the way, using 2-inch vaginal packing. The intrauterine radium is contained in a rubber tube cut to fit and sewed at both ends. This is sutured to the cervix so as not to slip and thereby produce over-irradiation to the rectum or bladder. After about 3,500 milligram hours' exposure time the radium is removed and the patient is allowed to rest 2 or 3 days before the entire process is repeated, thereby delivering the 6,000 gamma roentgens within a 10-day period. During the actual irradiation

tion the patient is kept in bed, has an indwelling catheter in place, and receives 300,000 units of Crystacilline daily. The latter is given in order to abort any potential infection in the pelvis. We have noted a definite decline in reactions to irradiation while following such a procedure.

The treatment of postirradiation complications cannot be covered at this time, but the subject has been well presented by T. F. Todd of Manchester in his splendid treatise written in 1938 (13).

After the course of irradiation has been completed the patient is discharged from the hospital and seen in the Out-Patient Clinic at 3-month intervals. A pelvic examination is done at each visit, as is a vaginal smear. Any induration of the cardinal ligaments or broad ligaments as felt rectovaginally means either tumor activity or reaction to irradiation. Before the diagnostic vaginal smear technique was introduced we were unable to distinguish between these two conditions, sometimes for many months. Now if the smear remains negative three months from time of treatment it may be safely concluded that the treatment was adequate and the patient may expect a cure. Conversely, if the vaginal smear becomes positive at any time or remains so after treatment, regardless of the clinical findings at the time, the patient most likely has a radioresistant tumor and has been inadequately treated. This is the case we may be able to salvage by radical surgery providing it has not become inoperable through metastasis while undergoing treatment with irradiation. Graham (14) has recently suggested such a method of follow-up utilizing the vaginal smear and has even gone so far as to prognosticate in certain cases as to the adequacy of the treatment employed by noting the reaction of both the normal and the malignant cells to irradiation: the complete disappearance of the latter from the smear usually after the twenty-fourth day of treatment signifies a favorable prognosis. This method, although based on too few cases, holds much promise and may be the answer to the problem of posttreatment evaluation and prognosis.

Finally it should be remembered that irradiation treatment failure in a case that was originally considered to be inoperable has not made that case operable. Treatment then is only palliative.

NONINVASIVE CARCINOMA OF THE CERVIX

Prior to the development of the vaginal smear technique certain pathological lesions of the cervix were reported, after biopsy, as being precancerous. Such designation was given to any surface epithelium that presented any dyskeratotic phenomena and also included frank cases of leukoplakia. Now, long after Pemberton and Smith, and

Schiller called attention to the essential changes (17) (2) in the make-up of the individual cell that labeled it malignant, we have the vaginal smear for early diagnosis of cervical carcinoma as well as carcinoma of the corpus uteri. The latter will not be discussed in this article.

In contradistinction to the invasive epidermoid or adenocarcinoma of the cervix, the intraepithelial noninvasive form presents no particular picture insofar as the history or pelvic findings are concerned. The diagnosis can be made only after a painstaking search of many sections of the cervix completely removed by conization. A vaginal smear in itself is not enough evidence, even though positive, to make such a diagnosis. However, such a smear should be taken of any woman who presents herself for examination and/or treatment of any apparently benign condition affecting the cervix uteri, especially if she has borne a child.

When a positive diagnosis of carcinoma in situ from biopsy specimen taken in the clinic is made, the patient is admitted to the hospital in order to do a complete conization of the cervix by sharp excision (3), including the entire squamocolumnar junction and most of the endocervix; biopsy of the entire cervix is considered by our Department and the Department of Pathology as being absolutely essential before any definite diagnosis of carcinoma in situ can be established. The practice of considering cancer to be noninvasive and treating it as such on the strength of a few biopsy reports of local specimens of the cervix, is strongly condemned.

The treatment of this condition is still controversial but the majority of the larger treatment centers are doing a total hysterectomy and leaving one or both ovaries behind. In recent publications TeLinde and Galvin (3), Pund et al. (16), and others have subscribed to this. Undoubtedly the issue has not been completely decided, but we feel that there is no indication for removal of the ovaries in cases where one can be reasonably certain that the lesion is a noninvasive variety of cancer. Until more evidence is compiled to prove us wrong we shall continue to treat carcinoma in situ in this manner (18).

A follow-up plan is maintained for these patients. They are seen at 3-month intervals, and any evidence of tumor activity is checked by both clinical and laboratory procedures. The same prognostic value can be attached to the vaginal smear in these cases as in those of the invasive variety. If the pathologist reports noninvasive cancer after serial section of the cervix we can be reasonably certain of a cure. On the other hand, if invasive cancer is proved to be actually present we augment surgery with a planned dose of irradiation based upon a modification of the method previously described. Thus rests the status of treatment of noninvasive cervical cancer at the present time.

SUMMARY AND CONCLUSIONS

A method of management of carcinoma of the cervix uteri has been presented. It is generally accepted by most authorities that invasive cervical cancer is best treated by a combination of radium and high voltage roentgen therapy.

Eight thousand gamma roentgens have been determined to be a cancerocidal dose if delivered at a vulnerable point in the paracervical triangle designated as "A," by a combination of high voltage roentgen and radium therapy through a modification of the Manchester Technique.

A diagnosis of carcinoma in situ cannot be accurately made without biopsy of the entire cervix; complete conization of the cervix is done by sharp excision. A positive vaginal smear in itself is not sufficient evidence to make the diagnosis.

If no invasion is found in the post-operative serially sectioned cervix, it may be assumed that a cure has been effected. If invasion is proved to be present the case is treated with irradiation as previously described but with certain modifications due to technical difficulties caused by the surgical removal of the pelvic structures.

Carcinoma in situ is treated, in most centers at the present time, by simple total hysterectomy. Oophorectomy is not done unless the patient is in the fifth decade and premenopausal, or if other ovarian pathologic changes require it.

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First Cable

5 AUGUST, 1858.—First trans-Atlantic cable message sent from New York to Europe. (There's no finer News you can tell your family—than that you're planning to stick with the Peacetime Payroll Savings Plan.)



Primary Sarcoma of the Heart

A Case Report¹

RUSSELL H. WALKER, *Commander (MC) U. S. N.*

THE proved cases of malignant tumors found in the heart and believed to have originated there are extremely few. Case reports of such tumors have appeared in the literature for many years, but it has been only within the past 30 years that these reports included careful histopathologic study, proof of their malignant character, and evidence of absence of a primary neoplasm elsewhere; such tumors have been accepted as primary malignant cardiac neoplasms. They have been identified as myxomas, rhabdomyomas, leiomyomas, lipomas, fibromas, and endotheliomas, and as sarcomas corresponding to these types. Neoplasms of the myxoma group (1) are the most frequently reported.

CASE REPORT

A 21-year-old white male entered the University Hospital 14 October 1948 with the chief complaint of dyspnea on exertion. He had noticed slight dyspnea for the past 4 years, but 1 month prior to entry the dyspnea rather suddenly became so severe that he could not continue his occupation as a laborer. He also complained of attacks of syncope, and weight loss of 26 pounds in the 6 months before hospitalization. There was no history of ankle edema, productive cough, hemoptysis, fever, nausea, or vomiting. He stated that he had had scarlet fever at 4 or 5 years of age with no after effects. History of no other serious illness, operations, accidents, or venereal disease was elicited.

Physical examination revealed a well-developed, well-nourished male who did not appear acutely ill. The blood pressure was 120/60, and the temperature, pulse, and respirations were normal. On examination of the heart, a presystolic murmur at the mitral area, a Grade I systolic murmur at the apex, and a loud, split, second pulmonic sound were noted. The heart was not enlarged. There were a few moist râles at both bases. The rest of the physical examination showed nothing of significance.

Examination of the blood showed 12.5 gm. of hemoglobin with normal red, white, and differential counts. Urine and stool examinations were normal, and the Kahn test on admission was negative. The sedimentation rate was reported within normal limits. Electrocardiograms were within normal limits with small QRS complexes in lead I. Roentgenologic examination showed signs of early

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pulmonary congestion, no evidence of active pulmonary disease, and normal cardiac diameters.

Digitalis, and ammonium chloride were prescribed to promote diuresis. After the institution of this therapy, the dyspnea improved. Blood cultures showed no growth at the time of his discharge. The patient remained afebrile throughout hospitalization and was discharged 21 October 1948.

He was readmitted 26 October 1948 with complaints of dyspnea, fainting, weakness, and precordial pain. The positive physical findings at this time included a strikingly pale skin; the heart was borderline in size with occasional premature beats; a soft diastolic mitral murmur was heard only when the patient was sitting up, and a loud rough systolic murmur was heard over the entire precardium, but best over the xyphoid. The pulmonic second sound was rough and louder than the aortic second sound. The neck veins were intermittently distended and pulsating. His chest was clear at times and at other times had fine râles at both bases.

He had a borderline anemia hemoglobin of 11 gm., which did not respond to treatment with ferrous sulfate. The white blood cell count, normal on admission, gradually rose to 17,000. Electrocardiograms taken when he was feeling well were within normal limits. During his episodes of dyspnea, however, large S waves in lead I suggested a sudden increase in the pulmonary blood pressure. Despite the negative urinary findings, he showed mild kidney impairment by a blood creatinine value of 1.9 mg. percent and nonprotein nitrogen of 55 mg. percent. Liver function tests were normal. Total serum proteins were normal. Muscle biopsy showed no evidence of disseminated vascular disease. Early roentgenograms of the chest showed mild pulmonary congestion; later they showed slight generalized cardiac enlargement with minimal bilateral pleural fluid and persistence of congestion. An electro-encephalogram was of borderline epileptoid type. Examinations of the eyes, ears, nose, and throat were normal.

Throughout his hospitalization the patient was afebrile. At times he felt well and at other times he was dyspneic, had left chest pain, was nauseated, and acutely apprehensive. He fainted several times although not subjected to undue strain. Digitoxin and diuretics were tried without improvement. Sedation gave no relief. Acute pulmonary edema occurred and the patient died 27 November 1948.

NECROPSY

The necropsy was performed 5 hours after death. The body was that of a well-developed white male, 169 cm. in length and weighing 126 pounds. There was a moderate edema of the ankles.

Each pleural cavity contained approximately 600 cc. of straw-colored fluid. The lung borders were found to touch in the midline at the second rib and the cardiac apex was 6 cm. to the left of the midsternal line at the fifth rib. The pericardium was smooth, white, and glistening, and the pericardial sac contained approximately 75 cc. of clear, straw-colored fluid. The heart measured 15 by 11 by 6 cm. and weighed 450 gm. The myocardium was deep red to maroon and there was no evidence of either old or recent infarction. The endocardium was smooth, pale, and glistening. The foramen ovale was anatomically closed. The left ventricular wall measured 10 mm. in thickness. The left atrium was found to be practically filled with a tumor mass (fig. 1). This was firmly adherent to the inter-atrial septum and covered the area normally occupied by the fossa of the foramen ovale. It also extended into and practically filled the left auricular appendage. This mass measured 9 by 4 by 3 cm. and nearly occluded the right pulmonary veins. The tumor was gray-brown, indurated, and sectioned

with considerable resistance, revealing a red-pink surface with areas of yellow-gray. Attached to the main tumor mass there were two additional growths. Each produced a polypoid botryoid mass, one lying directly over the other. Each was separately attached to the indurated tumor by a base which was 1 cm. in diameter. Together these polypoid masses measured 6 by 3.5 by 3.5 cm. They were soft and yellow-white. When sectioned, a moderate amount of white mucoid fluid escaped. Both pedunculated tumors extended through the mitral valve for a distance of 1.5 to 2 cm., greatly encroaching upon the lumen. The portions which extended through the mitral valve were blue. This discoloration was thought to be caused by the trauma of the opening and closing of the mitral valve, or by interference with the circulation of the tumor by constriction at the level of the valves. When these areas were incised they were found to be considerably softer than the nontraumatized portions in the atrium. The mitral valve was 105 mm. in circumference; the tricuspid, 130 mm.; the aortic, 65 mm.; and the pulmonary, 70 mm. The thickness of the right ventricular wall was 5 mm.



Figure 1.—Tumor in left auricle with extension through the mitral valve.

The left lung weighed 1,270 gm. and the right, 1,180 gm. The lungs were firm throughout, with hemorrhagic areas which varied from red to dark maroon. On sectioning a large amount of edema fluid escaped from the parenchyma, but the lungs floated when placed in water. The bronchi of both lungs contained a moderate amount of edema fluid. There was no neoplasm in the lungs.

The thoracic aorta measured 37 mm. in circumference and the abdominal, 30 mm. There was moderate atheromatous change.

The peritracheal lymph nodes were enlarged, the largest being 1.5 cm. in diameter. They did not appear neo-

plastic. The thyroid measured 6 by 4 by 1.5 cm. and weighed 16 gm. No adenomata were found.

The peritoneum was smooth, white, and glistening, and the peritoneal cavity contained approximately 1,000 cc. of clear straw-colored fluid. A Meckel's diverticulum, 2.5 cm. in length, was found 30 cm. above the ileocecal valve.

The liver extended 5 cm. below the ensiform and 9 cm. below the right costal margin. It measured 24 by 18 by 7 cm. and weighed 1,560 gm. Passive congestion was described as being extreme.

The left kidney weighed 93 gm.; the right, 230 gm. Both kidneys showed fetal lobulation and other than the variation in size were not remarkable.

Microscopic Examination

Heart.—There was beginning serous atrophy of the subepicardial fat and slight endocardial sclerosis. The neoplastic mass in the left atrium was found to be a myxofibrosarcoma (fig. 2) with small areas of bone formation (fig. 3). The neoplasm varied greatly in cellularity and showed extensive necrosis in some areas. In some regions the neoplasm had penetrated through the atrial wall. Adjacent to the tumor the myocardial fibers showed degeneration, and there was lymphocy-

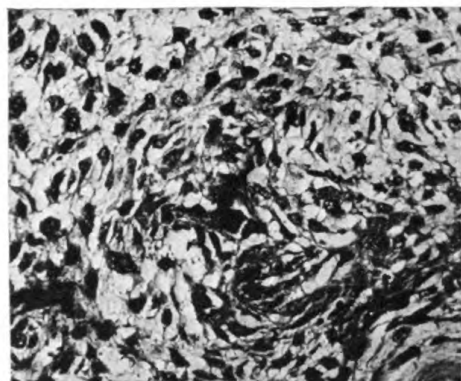


Figure 2.—Myxofibrosarcoma at the zone in which it was invading the myocardium. Hematoxylin and eosin stain. (X 57)

tic infiltration into the degenerating myocardium along the margin of the tumor. Sections from the polypoid growths showed this tissue to be clearly myxomatous (fig. 4), and moderately cellular.

Lungs.—The lungs showed acute edema, marked acute exacerbation of chronic passive congestion, and hemorrhage into many alveolar spaces. No fat emboli were demonstrated by a fat stain on frozen sections.

Liver.—An acute exacerbation of chronic passive congestion and marked degenerative fatty infiltration, confirmed by special staining, were the chief features in the liver.



Figure 3.—Area of bone formation in the myxofibrosarcoma. Hematoxylin and eosin stain. (X 300)

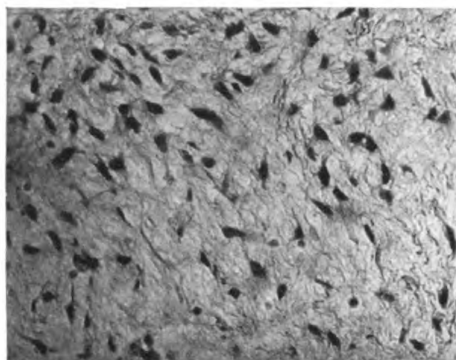


Figure 4.—The grossly myxomatous portion of the tumor which protruded into the left ventricle. Here the histologic structure is that of a practically pure myxoma. Hematoxylin and eosin stain. (X 300)

COMMENT

The literature on primary cardiac tumors has been reviewed recently (2) (3) and no attempt will be made to repeat that material. As malignant tumors of the heart are usually found arising in either the right or left atrium and adjacent to or in the area of the foramen ovale, two theories exist as to their origin. It has been thought that these tumors arise from embryonal rests (4). Other tumorous growths are apparently thrombi which have undergone myxomatous organization (5) (6). In that event they are not true neoplasms, but it is also possible that in such structures malignant proliferation may occur and thus they may be the source of true malignant myxomatous tumors found growing in the atrium.

The most frequently found malignant tumors originating in the heart are those which are derived from mesenchyme and contain one or more of the supporting tissues. These tumors usually do not metastasize but continue to grow until they nearly fill an atrial chamber with resulting embarrassment of the circulation (7). They often protrude through the valve into the corresponding ventricle as a polypoid structure. The tumor presented in this article grew in this manner and also was found to be invading the myocardium. In the absence of metastasis, the criteria for malignancy must be anaplasia, increased cellularity, and, particularly, infiltrative growth.

The signs and symptoms are confusing to the clinician for they may be transient or variable from day to day, and the dyspnea may be out of proportion to the physical findings. The tumor may exert a ball-valve effect and in such cases there may be marked relief of symptoms by postural changes. Many of these patients die suddenly. It has been stated also that mitral stenosis occurs in 50 percent of the cases (2) (8) (9).

Primary sarcoma of the heart, although extremely rare, should be considered by the diagnostician when he is confronted with a cardiac problem in the form of a patient who has shifting symptoms and signs that do not fit into the picture of the more common cardiac lesions. As some of these tumors have metastasized (7), a diagnosis of sarcoma made by biopsy of a lesion elsewhere in the body of a patient with changing cardiac signs should direct one to the possibility that the primary site may be in the heart. However, in such a case the myocardium may be the site of metastatic deposits (10).

Malignant tumors also may invade the heart by direct extension from adjacent structures. Such secondary invasion, although not common, is considerably more frequent than is primary sarcoma.

Another cardiac tumor which may be misinterpreted as a primary sarcoma is the so-called "myxogumma" described by Warthin in infants and young children (11). These infants are syphilitic and one should suspect syphilis in cases in which a "myxomatous-like" tumor is found in the newborn. This condition has become rare because of the general use in the United States of prenatal antiluetic therapy.

The incidence of sarcoma of the heart is difficult to determine. Ewing (12) cited 15 cases of "primary" sarcoma along with 33 cases of myxoma and 12 cases of congenital rhabdomyoma. Straus and Merliss reported 163 collected cases of "tumor of the heart" (3). Numerous authors have given other statistics. The case herewith presented was the first case of primary sarcoma of the heart found in 11,101 necropsies at the University of Michigan, although other

cases are available in which polypoid parietal thrombi were undergoing fibroblastic and myxomatous organization.

Although one cannot state whether it originated in an attached thrombus undergoing organization or in an embryonal rest, this large sarcoma had its origin in the heart, in which it invaded and destroyed the myocardium, and caused death by circulatory obstruction.

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Angiomatous Tumors of the Mesentery

Report of Three Cases

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TUMORS of the mesentery, cystic or solid, are uncommon manifestations of abdominal pathology, difficult of diagnosis and of classification. Keesey (1) in 1938 reported finding approximately 400 cases of cysts of the mesentery in the literature since the year 1507, and Hart (2) in 1936 reported 186 solid tumors of the mesentery after a comprehensive review of the literature. Mills (3) reported the occurrence of 6 cases of fibroma for a 5-year period ending in 1942.

With regard to the frequency of the recognition of specific mesenteric tumors, Bowers (4) in 1906 found the lipomata to be most common and fibromata rare. Szenes recorded 60 cases in 1918, which Wiener (5) classified as follows: Fibroma, 25 (41 percent); lipoma, 7 (11 percent); sarcoma, 22 (39.5 percent); lymphosarcoma, 3 (4 percent); endothelioma, 2 (3 percent); and carcinoma, 1 (1.5 percent).

Rawls (6) classified solid growths of the mesentery into lipoma, fibroma, carcinoma, and sarcoma. Rankin and Major (7) in 1932 collected 22 cases of tumors of the mesentery from 820,000 admissions to the Mayo Clinic and classed them as follows: Serous cysts, 2; chylous cysts, 2; sanguineous cysts, 2; lipomata, 5; fibromata, 2; and malignant tumors, 8. In this series, solid tumors outnumbered cystic tumors, and malignant growths formed the largest separate classification.

Penberthy and Brownson (8) in 1938 believed that dermoid cysts of the mesentery were the rarest tumors occurring in that organ, and Shapiro and Horwitz (9) in 1943 reported the only known case of solitary neurogenic sarcoma of the mesentery.

Angiomatous mesenteric growths, with or without malignant change, may be included in the list of pathological rarities. Hart cites 2 in his review of 86 cases reported after 1920. These 86 cases were classified: Lipoma, 12; fibroma, 26; sarcoma, 35; cavernous hemangioma, 2; teratoblastoma, 2; lymphangioma, 1; lymphoma, 1; myxoma, 1; amyloid

tumor, 1; osteosarcoma, 1; neuroma, 1; undesignated type, 2; and mixed mesodermal, 1. Of this series, he says most solid tumors of the mesentery are benign, metastases are rare, and malignancy low, but he also cites a case reported by Rankin and Major exhibiting metastases to the liver 6 years after primary surgery. Of the cavernous hemangioma, he records one case reported by Schmitt, occurring in a female, age 21 years, in whom the presenting symptom was a left-side abdominal tumor the size of a fetal head, and one case reported by Ambrumyants occurring in a boy, age 5 years, who suffered from birth from a slowly enlarging tumor and daily vomiting. In Schmitt's case, no pre-operative diagnosis was made; the treatment was resection; the post-operative diagnosis was cavernous hemangioma of the mesosigmoid; the result, recovery. In Ambrumyants' case, the pre-operative diagnosis was intraperitoneal tumor; the treatment, resection of 12 feet of small intestine; the post-operative diagnosis, diffuse cavernous hemangioma of the mesentery of the small intestine; the result, death in 5 months caused by continuous diarrhea.

CASE REPORTS

Case 1.—A 27-year-old white female was first seen 2 January 1946 with the chief complaint of pain in the left costal vertebral angle of 24 hours' duration. She described the spontaneous onset of a sharp, nagging, persistent pain relieved by lying on the left side and increased by lying on the right side. She said she had noticed a tender mass below the left costal margin shortly after the onset of pain.

The past history and family history were essentially negative.

Physical examination: Temperature, pulse, respirations, and blood pressure were within normal limits. The only significant positive finding was a tender mass, well demarcated, in the left upper abdominal quadrant extending about 9 cm. below the costal margin.

Laboratory data: Red blood cells, 4,100,000; hemoglobin, 12.5 gm. or 83 percent; platelets, 310,000; leukocyte count, 10,150. Differential count: Segmented forms, 77; lymphocytes, 12; monocytes, 7; eosinophils, 3; basophils, 1; bleeding time, 1 minute, 15 seconds; coagulation time (capillary blood), 2 minutes, 45 seconds; sedimentation rate (Cutler), 24 mm./hr.; prothrombin time, 62 percent of normal; urinalysis, negative; and Kahn reaction, negative.

On admission, roentgenograms of the abdomen failed to reveal a definite splenic outline. There was a suggestion of an enlargement of the splenic

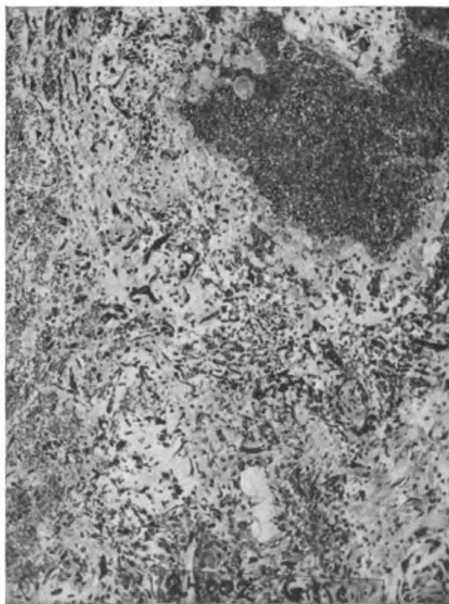


Figure 1.—Case 1. Low-power photomicrograph showing the cystic vascular structure of the tumor.

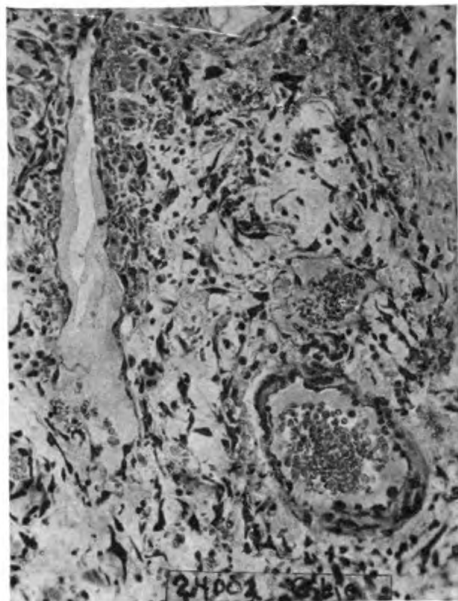


Figure 2.—*Case 1. Photomicrograph from an area which shows the growing portion of the tumor with numerous capillaries and proliferating endothelial cells.*

surfaces (fig. 1). Along one end the lining is thickened and hemorrhagic. The second specimen consists of numerous pieces of blood clot, measuring from 1 cm. in diameter to 5 by 1 cm. The sections show part of a cyst wall which is lined in places by endothelium; in other places by fibrous tissue which is undergoing collagenous degeneration. There are many new capillaries, surrounded by proliferating endothelial cells intermingled with zones of fresh hemorrhage (fig. 2).

Pathological diagnosis: Cavernous angioma of the mesentery with cystic dilatation.

The post-operative course was uneventful and the patient was discharged on 22 January 1946.

Case 2.—A 23-year-old white female was found to have an abdominal mass during a routine physical examination. She said she had noticed it several years before, but had had no symptoms other than intermittent episodes of mild indigestion.

Physical examination: Temperature, pulse, respirations, and blood pressure were within normal limits. The physical examination was essentially negative on admission, 19 February 1945, with the exception of a firm, irregular, freely movable, nontender mass about 6 cm. in diameter in the right upper quadrant just lateral to the umbilicus.

Laboratory data: Leukocyte count, 9,800; hemoglobin, 13.6 gm. or 93 percent. Differential count: Band forms, 1; segmented forms, 63; lymphocytes, 28; monocytes, 6; eosinophils, 1; basophils, 1; sedimentation rate (Cutler), 8 mm./hr.; Kahn reaction, negative; and urinalysis, negative.

A flat film of the abdomen without preparation of the colon showed normal psoas and kidney outlines and a shadow of density similar to the density of the kidney lying with its upper pole at the level of the first lumbar intervertebral

shadow extending over the upper pole of the kidney, which in turn appeared somewhat larger than usual. The hepatic flexure was outlined by gas, was high in position, and showed unusual redundancy. These findings were thought to be consistent with splenic hemorrhage.

The day after admission the red blood count dropped to 3,300,000 and the hemoglobin to 9.5 gm. or 65.5 percent.

Operation: On 4 January 1946, under sodium pentothal and ether anesthesia, a left upper rectus incision was made. A cyst the size of a grapefruit was found in the mesentery of the transverse colon. Blood was aspirated from the cyst, and it was opened widely and the lining removed except for a small amount of the base. The area was then packed, and the abdomen closed.

Pathologic examination: The specimen consists of a long, flat, thin piece of membrane resembling a cyst wall, measuring 8 by 6 by 0.2 cm. It is gray-white in color and has smooth, shiny

space and extending for a length of 9 cm. approximately $2\frac{1}{2}$ cm. wide, overlying the upper pole of the right kidney. The ascending and transverse colon was outlined by gas and lay well below this soft tissue mass. The inner border of the mass overlay the psoas outlines, and a mass of soft tissue density.

With a barium enema the colon filled promptly and no gross defects were noted. The hepatic flexure lay somewhat lower than usual. A mass was noticed somewhat above the mid-right abdomen, freely movable, and not connected with the colon. A good amount of barium passed through the ileocecal valve and the terminal ileum appeared normal. That portion of the colon which emptied showed a normal mucosal pattern. The mass of soft tissue density was partially outlined on the film taken after the barium enema. The impression was a normal colon and terminal ileum. The mass appeared to be most likely a mesenteric cyst. A pre-operative diagnosis of mesenteric cyst was made.

Operation: On 12 March 1945, under spinal pontocaine and intravenous sodium pentothal anesthesia, an exploratory laparotomy was performed through a right upper rectus muscle splitting incision. A mass about 5 by 5 by 1 cm. within the round ligament of the liver was found and resected. The appendix was removed and the abdomen closed without drainage.

Pathologic examination: The specimen consists of a tumor from the ligamentum teres of the liver and an appendix. The tumor measures 5 by 4 by 0.5 cm. and is attached to a pedicle. It sections with increased resistance, revealing a cut surface made up of fibrous tissue, muscle, and large blood vessels. The tumor is encapsulated by a fibrous capsule measuring 2 mm. in thickness. The sections show tumor tissue in which arterioles with thickened walls are a conspicuous feature. The walls of these vessels show hyaline degeneration and are surrounded by muscle cells which form the main mass of the proliferating tissue in which the vessels appear to be embedded (fig. 3).

Masses of these cells also are undergoing hyaline degeneration and partial replacement by pink-staining collagenous material. Occasional zones of beginning ossification are found in the areas of degeneration. Among these muscle fibers are numbers of tightly packed spindle cells with densely stained nuclei, the majority are of moderate size and uniform shape. Here and there, however, are pleomorphic forms and occasional tumor giant cells. The histologic picture is that of a degenerating angiomyoma, which shows a secondary proliferative process with malignant features.

Pathological diagnosis: Angiomyoma with Grade I malignant change.

The post-operative course was uneventful and the patient was discharged on 16 April 1945.

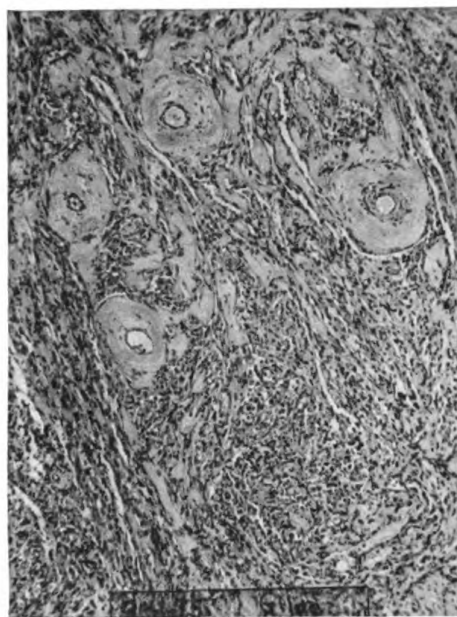


Figure 3.—Case 2: High-power photomicrograph showing the degenerating hyalinized walls of the arterioles and the proliferation of malignant leiomyomatous tissue about the vessels.

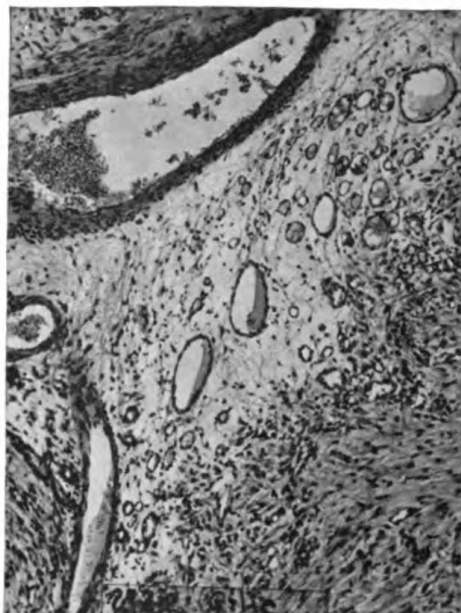


Figure 4.—Case 3: Photomicrograph showing the vascular structure of the lesion and the bundles of smooth muscle which occupy the periphery of the microscopic field.

Case 3.—A 22-year-old white female was seen 6 November 1945 complaining of intermittent swelling of the lower left abdomen of 6 weeks' duration. She described episodes of sharp pain in the lower left quadrant sometimes lasting for 3 or 4 days accompanied by nausea and vomiting. She said she had fainted occasionally with the sudden onset of pain. The patient described intolerance to fatty foods and a 15-pound weight loss during the preceding year. Seven months before admission she had been treated for suprapubic pain associated with dysuria. She gave a history of kidney trouble in childhood and of dysmenorrhea.

Physical examination: Temperature, 97.0° F.; pulse, 90; respirations, 20; and blood pressure, 120/80. The physical examination was essentially negative except for a globular mass about 6 cm. in diameter to the left and slightly above the umbilicus, soft and painful to palpation.

Laboratory data: Hemoglobin, 13.5 gm. or 93 percent; leukocyte count, 8,250. Differential count: Band forms, 5; segmented forms, 49; lymphocytes, 37; monocytes, 7; eosinophils, 2; sedimentation rate (Cutler), 13 mm./hr; Kahn reaction, negative; serum amylase, 200 units; urinalysis, negative, including culture of catheterized specimen; bleeding time, 3 minutes, 30 seconds; coagulation time (capillary blood), 2 minutes; prothrombin time, 22 seconds or 94 percent of normal; total serum proteins, 6.6 mg. per 100 cc.; serum albumin, 4.7 gm. per 100 cc.; serum globulin, 1.9 gm. per 100 cc.; nonprotein nitrogen, 34 mg. per 100 cc.; and blood glucose, 103 mg. per 100 cc.

Scout films of the abdomen taken on 4 November 1945 revealed what appeared to be a rounded homogenous increase in density in the abdomen on the left extending from the left upper quadrant downward to about 2 cm. from the left iliac crest. There also appeared to be some displacement of the stomach by pressure on its greater curvature as well as some displacement of the bowel, probably descending colon, toward the right. There was noticeable enlargement of the liver, the inferior margin of which was about 1½ cm. from the right iliac crest. The mass partially obscured the left psoas shadow. This was thought to be an enlarged spleen. A gastro-intestinal series done on 10 November showed no evidence of pathologic changes in the esophagus, stomach, duodenum, or upper portion of the jejunum, all of which filled and outlined normally. There was a round tumor mass seen in the abdomen lying just above the pelvis and slightly to the left which measured between 10 and 12 cm. in diameter causing some displacement of the stomach and small bowel. Review of the previous films showed no outline of the tumor mass on the flat plates. It was thought that a cyst with a long pedicle was present, and a pre-operative diagnosis of mesenteric cyst was made. On 15 November 1945, following a physical examina-

tion, the patient developed acute left upper quadrant pain and a noticeable increase in the size of the palpable mass was noted. Immediate operation was deferred because it was thought that hemorrhage into the cyst had occurred and no acute emergency existed.

Operation: On 16 November 1945 under ether inhalation anesthesia an exploratory laparotomy was done. A globular mass about 12 by 8 by 5 cm. arising from the region of the tail of the pancreas was found in the lesser peritoneal sac. This was removed and the wound closed in layers.

Pathologic examination: The specimen consists of an oval encapsulated tumor mass measuring 11 by 8 by 4.5 cm. On the surface there is a pedicular attachment of yellowish tumor measuring 3 by 2 cm. The cut surface reveals a rough, whorled, white tissue with numerous small cystic spaces, some of which contain blood and others a clear mucinous fluid. The sections show collagenous and loose reticular fibrous tissue in which there are numerous thin-walled and capillary blood spaces. There is also some associated adipose tissue, a few large muscular arteries and nerve bundles. In places the lumens of the muscular arteries are almost occluded by their thickened walls. Throughout the sections there are bundles of smooth muscle fibers which form isolated masses (fig. 4).

Pathologic diagnosis: Hemangiomyoma.

The post-operative course was uneventful and the patient was discharged on 5 January 1946.

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Cystic Fibrosis of the Pancreas

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CYSTIC fibrosis of the pancreas is a congenital and familial disease characterized by absence or gross deficiency of the secretion of pancreatic juice with consequent poor digestion and poor utilization of protein, starch, fat, and fat soluble vitamins. The characteristic clinical features are: Onset within the first 2 years of life; failure to gain weight on a normal diet; an excellent appetite; large foul stools; and the development of chronic bronchitis, bronchopneumonia, and often bronchiectasis. The disease is not uncommon, the pancreatic lesion having been found in about 3 percent of the necropsies at the Babies Hospital, New York.

The earliest pathologic description of the pancreatic lesion was recorded by Landsteiner (10) in 1905, in an infant dying with meconium peritonitis. Garrod and Hurlley (11) recorded the first clinical observations in 1913 of a case of congenital steatorrhea where the brother also died of steatorrhea and bronchopneumonia. Passini (12) in 1919, recorded the first case in which a digestive anomaly was associated with a proved pancreatic lesion. In 1924 a case presenting the celiac syndrome with both clinical and pathologic observations was reported by Clarke and Hadfield (13). There are now several hundred cases in the literature. Siwe (14) was the first in 1932 to confirm the diagnosis by duodenal drainage examination. In 1938 Anderson (1) reviewed 49 cases and concluded: (a) The disease is more common than supposed; (b) the pancreatic deficiency is primary and the vitamin A deficiency secondary; and (c) the respiratory symptoms, which often obscure the digestive disturbances, follow the pancreatic deficiency and probably are due to vitamin A deficiency.

The disease is familial and occurs in approximately one-fourth of the siblings in affected families. The incidence is 2 to 4.8 percent in the autopsies of children. The disease may occur in twins (5) and is equally distributed in both sexes. The four theories which have been advanced as to the cause of cystic fibrosis of the pancreas are as follows: (a) Deficiency of vitamin A with resulting squamous metaplasia and obstruction of the pancreatic ducts; (b) congenital stenosis or atresia of the ducts; (c) blockage of the ducts caused by the production of abnormally thick, inspissated acinar secretions; and (d)

deficiency of secretin because of a congenital absence or a defect in release of secretin from the intestinal mucosa or because of excessive amounts of secretinase in the blood.

The fourth theory seems more plausible since Baggenstoss et al. (4) demonstrated that secretin is always absent from the duodenal drainage of living patients and from the intestinal mucosa of patients dying of cystic fibrosis. They postulated that in the absence of secretin to stimulate the pancreas, the thick viscid fluid already present as a result of nervous stimulation would result in stasis and accumulation of material in the acini.

The alterations in physiology resulting from the pancreatic deficiency are summarized briefly as follows (2) :

(a) About 20 to 65 percent of dietary protein is excreted in the feces because of little or no tryptic activity.

(b) Twenty to sixty percent of the dietary fat is excreted in the feces resulting in loss of calories as well as fat soluble substances.

(c) Vitamin A and carotene are poorly absorbed as shown by vitamin A tolerance tests. Although osteoporosis is common there is no evidence of vitamin D deficiency. Occasionally hemorrhagic phenomena develop caused by lack of vitamin K. The serum cholesterol is usually below normal.

(d) Carbohydrates are well utilized.

(e) Twenty-five to forty percent of the dietary calories are lost in the feces, especially on a high fat diet.

(f) It has not been definitely proved that vitamin A deficiency results in the pathologic pulmonary changes, since in other patients with vitamin A deficiency alone, bronchitis does not occur. Some additional factor in cystic fibrosis must account for the pulmonary complications. It has been shown that the pulmonary complications occur in a much greater percentage in the young group (one year or less) than in the older group. In the young group the presenting complaint is referred to the respiratory tract and roentgenograms of the lungs show severe pulmonary infiltrations and emphysema.

Classification of types on the basis of age are: (a) Congenital intestinal obstruction caused by meconium ileus; (b) cases with onset of respiratory infection by the sixth month to one year (young group); and (c) cases with onset of symptoms predominately gastro-intestinal after one year (old group).

We will concern ourselves with the second group in which the onset at the sixth month was predominately respiratory involvement (young group).

CASE REPORT

A 9½-month-old infant was admitted with a history of intermittent diarrhea and bronchitis of 3 months' duration. The weight on admission was 15 pounds

and 8 ounces; about 3 pounds under weight. Birth weight was 7 pounds and 1 ounce. Growth and development were normal until the child was 6 months of age. At that time the patient developed an acute febrile illness with diarrhea and loss of weight. This persisted with 10 watery stools daily in spite of treatment and 2 weeks later the patient showed an acute upper respiratory infection which was successfully treated with penicillin and sulfonamides. The stools continued to be loose or watery for the next 2 months in spite of frequent changes in formula. The patient had another acute upper respiratory infection 6 weeks before admission which responded to chemotherapy.

Three weeks prior to admission the stools had become quite foul-smelling, bulky, and greasy in nature on a diet of homogenized milk. The patient's appetite was good and she was taking 2½ quarts of milk a day as well as fruits, cereals, and vegetables. Also, during this period, the child had an acute, persistent bronchitis. Inflammation of the vaginal orifice, with dysuria occurred at times. The abdomen had been quite large for the past 2 months. The patient had been eating 1 banana a day for the past 2 months, and had been receiving visyneral aqueous vitamin A and D and 100 mg. ascorbic acid daily.

Physical examination revealed a fairly well-developed, thin, pale infant with a protuberant abdomen but no wasting of the extremities. She did not appear acutely ill. There was no gross abnormality, and all findings were essentially normal except for profuse coryza, occasional coarse râles in the chest, and a palpable liver edge 1½ fingers' breadth below the costal margin. Laboratory studies including 2 determinations of duodenal drainage; glucose tolerance tests; gastro-intestinal series, chest, wrist, and long bone roentgenograms; repeated stool cultures; repeated urinalyses and complete blood counts; sedimentation rate; tuberculin and histoplasmin skin tests; blood urea nitrogen; serum cholesterol; total protein, albumin, and globulin tests were all within normal limits.

Table 1 is a summary of the stool examinations made. The normal values and those found in cystic fibrosis are also given (8) (9). The excretion of nitrogen was above normal, and when calculated on the basis of daily nitrogen intake, the output is 16 to 20 percent; normal range is 4 to 12 percent.

A simple test was used to detect trypsin in the stool. A piece of exposed x-ray film was placed in a small test tube partially filled with a solution of 5 percent sodium bicarbonate to which a small quantity of stool had been added. This was incubated at 37° C. for 1 hour. The presence of trypsin was evidenced by clearing of the x-ray film, in that the gelatin was absorbed from the film surface. A daily check with controls was made of the patient's stool and after 4 days' treatment with pancreatin the tryptic activity was equal to that of the control stools. This practical test is adaptable to office use and is purely qualitative.

TABLE 1.—*Stool examinations*

[Normal: 7.3, dry weight; 5 to 25 percent, total fat; and 0.39, nitrogen]

Specimen No.	Dry weight	Total fat	Nitrogen
	<i>Grams</i>	<i>Percent</i>	
1.....	14.7	40	962 mg.
2.....	11.7	25	975 mg.
3.....	12.2	31	1,200 mg.
4.....	70.6	28	2.34 gm.
Pancreatic fibrosis.....	33.4	41	1.7 gm.

The patient was given 300,000 units of penicillin, a regular infant diet, whole milk homogenized, and 20 drops of visyneral daily. The croupy cough and course râles continued for the first 3 weeks. Fluoroscopic examination of the chest revealed no abnormalities. The stools were foul smelling, almost rancid, bulky, greasy, and filled with undigested food particles. The patient ate two to three times the normal amount of food for a child of her age. The penicillin dosage was reduced to 150,000 units every other day, but the respiratory symptoms became more severe and the dosage of penicillin was increased to 300,000 units daily again.

After administering penicillin for 3 weeks and under regular diet the patient showed a remarkable improvement. At the end of 3 weeks she was given pancreatin powder; 1 tablespoon 4 times a day in milk. The patient weighed 18 pounds and 4 ounces on discharge; a $2\frac{3}{4}$ pounds gain in 1 month.

At discharge, the following medications were prescribed: Pancreatin, 1 tablespoon 4 times a day; visyneral, 20 drops 3 times a day; 1 or 2 bananas daily; penicillin solution by mouth (140,000 units daily); a high protein, high carbohydrate, and low fat diet. This is the accepted treatment for this condition.

Recently some investigators (3) have shown that in their series of cases (in the young group) marked improvement and weight gain occur on a regular diet without the administration of pancreatin; chemotherapy was used only for pulmonary infections. This group responded well when penicillin, by injection and/or aerosol inhalations, was given continuously over a period of 6 weeks to 1 year. It has also been shown that water soluble vitamins A and D are more easily absorbed than the oily preparations and these are given in the usual doses 3 times a day. Another substance, Tween 80, a detergent, has been found to emulsify the fatty substances in the small intestine thus giving better absorption. It has been shown by vitamin A tolerance curves in cystic fibrosis patients, that the use of Tween 80 permits greater absorption of vitamin A (7).

With the new concept that secretin deficiency may be a cause of cystic fibrosis, it is possible that secretin is of value in the treatment of early cases. In the older age group of patients with cystic fibrosis, the destruction of the pancreatic parenchyma is so extensive that stimulation with secretin might cause further damage by increasing secretory pressure; thus producing rupture of a ductule and additional destruction of the parenchyma. If secretin is a factor it is important to make an early diagnosis, so that treatment can be instituted early.

With the advent of chemotherapy, the prognosis has improved although it is still poor for those patients who contract respiratory infections in the first 2 or 3 months of life.

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Remember Hiroshima?

8 AUGUST 1945.—The first atomic bomb in history was dropped on Hiroshima. Splitting the atom revolutionized all our theories of nuclear physics—just as the overwhelming success of the Payroll Savings Plan did away with a lot of notions about the difficulty of saving money.



Thrombo-Embolism

CAREY C. WOMBLE, *Lieutenant (MC), U. S. N.*

ONE OF the most controversial subjects in medicine today is the management of thrombo-embolic disease. Each of the major medical centers has developed to a high degree of efficiency its own method of solving this problem. In such hands the various methods appear to satisfy the basic requirements of successful medicine: a high protection with a minimum of undesirable side-effects and after-effects. It remains to be seen what should be the course of action in smaller hospitals, clinics, and private practices, where the patient load is small and the experience with thrombo-embolism limited.

The problem as presented by various authors is as follows:

(a) Deaths from thrombo-embolic disease occur frequently in all phases of medical practice. In 200 consecutive autopsies, the cause of death in 11 was pulmonary embolism (6 were medical cases and 5 were surgical cases) (10). In many large series of post-mortem examinations, pulmonary embolism is given as the cause of death in 2 to 6 percent of all deaths and in 5 to 6 percent of post-operative deaths (4).

(b) It is a significant source of morbidity and mortality in all post-operative cases. About 1 percent of post-operative cases of all ages have thrombo-embolic disease; about half of these cases have one or more pulmonary emboli and one-fifth of them succumb to pulmonary emboli (4).

(c) Its incidence increases with age and is more frequent in major surgical conditions below the diaphragm. Eighty-two and three-tenths percent of the cases of thrombophlebitis occurred in patients over 40 years of age (1). About one-half of all middle aged and older persons who have been bed-ridden for any length of time (medical as well as surgical cases) have thrombosis of the deep veins of the legs (10). Twelve percent of 458 post-operative cases over 65 years of age developed phlebitis and 5.5 percent developed fatal embolism; one-fifth of the hip fracture cases in this age group developed phlebitis and one-half of these succumbed to fatal emboli; the same frequency is reported for gastrectomy (1).

(d) Thrombophlebitis frequently is not clinically evident when pulmonary emboli occur. In only 55 percent of cases of thrombo-embolism was a clinical diagnosis of thrombophlebitis made; in 40 percent of post-operative fatal pulmonary emboli neither clinical nor post-mortem evidence of venous thrombosis could be found ("it must be assumed that the entire thrombus had become detached to form the embolus"); in only 15 percent of post-operative fatal pulmonary emboli did clinical evidence of thrombophlebitis appear (4). Only 15 percent of patients who have clinical post-operative thrombophlebitis later develop pulmonary embolism, but one-third of those cases succumb to the emboli (4).

(e) Most initial pulmonary emboli are not fatal but they are always serious. About one-third of all patients who have had post-operative pulmonary emboli have had subsequent pulmonary emboli, and more than half of these have had fatal pulmonary emboli (4) (15).

(f) The incidence of venous thrombosis, pulmonary emboli, and fatal emboli in severe infectious diseases (such as typhoid, pneumonia, and so forth), carcinoma, congestive heart failure, blood dyscrasias, and postpartal cases is in approximately the same order as in post-operative cases (4). Thrombo-embolism has occurred in about 2 percent of cases of lobar pneumonia (5). In primary recurrent idiopathic thrombophlebitis pulmonary embolism occurred in 12 percent of cases and fatal emboli occurred in 5 percent (4). The problem is the same in the smaller medical units in spite of the fact that the lower patient load makes thrombo-embolic disease unimpressively infrequent. The same situation exists in military practice where the average age of the patient is low and general health considerably above average.

The methods of prophylaxis and therapy are numerous, falling in the categories of medical, surgical, and nursing care. The general measures of elevation, heat, elastic bandages, exercise and massage of the lower extremities, deep breathing exercises, early ambulation, and sympathetic nerve block appear well established and widely practiced. The prevention of thrombo-embolic disease in surgical cases by such measures as suitable preparation of the patient for surgery, gentle operative technique, and prevention of venous stasis during convalescence has only served to reduce the incidence of thrombo-embolism from 1:333 to 1:800 (1). It is evident from this that a specific solution to this problem is needed, one that will not only minimize the risk to life and limb when thrombo-embolism exists, but one that will anticipate and prevent this dread and unnecessary complication. The basic controversy seems to be over the alternative use of anticoagulants or vein ligation (with thrombectomy where indicated).

Both of these important approaches to the specific management of thrombo-embolism have numerous proponents. One is impressed by the indisputable fact that both methods in experienced hands have been eminently successful. While the reports on this subject have come from many medical centers, the chief protagonists in the field have clearly narrowed to two: the Mayo Clinic, where chief dependence is placed in anticoagulants, and the Homans-Allen-Linton school in Boston, where vein interruption was found to be the more satisfactory basis for management. These two centers where chief reliance has been placed in one of these methods to the near exclusion of the other regimen, have had the largest number of reported cases of thrombo-embolism. Each of these groups originally developed its plan of management for the therapeutic control of already existing thrombo-embolism. But, as these two groups have such large numbers of patients that the consequent occurrence of thrombo-embolism is quite frequent in both medical centers, it was natural that the indications for the use of embolus-preventing treatment would be broadened to include prevention of venous thrombosis in those groups of patients so patently susceptible to intravenous clotting.

At the Mayo Clinic it is considered that anticoagulant therapy is indicated (*a*) in patients showing clinical evidence of existing thrombo-embolic disease; and (*b*) post-operatively where the risk of thrombo-embolism is increased because of age, obesity, a history of past episodes of thrombo-embolism, varicose veins, heart disease, anemia, or other blood dyscrasias. Chief reliance is placed in Dicoumarol which is given to maintain the prothrombin time at 10 to 30 percent of normal, the usual dosage being 300 mg. initially, and 200 mg. daily. In cases of active thrombo-embolic disease Heparin is given intravenously every 4 hours until the desired Dicoumarol effect on prothrombin time is attained (on about the third day.) The quick prothrombin time test, or a modification is recommended (14). This is considered to be a difficult test in regard to accuracy. It must be carefully controlled, all tests must be done by the same technician, while each supply of reagent must be standardized against the last. The contraindications to Dicoumarol therapy are: (*a*) renal insufficiency; (*b*) hepatic disease with existing prothrombin insufficiency; (*c*) purpura of any type; (*d*) subacute bacterial endocarditis; (*e*) obstruction of the gastro-intestinal tract with persistent vomiting (or necessity for repeated drainage); and (*f*) early post-operative brain and spinal cord diseases. It is used with great caution when ulcerative or potentially bleeding lesions (such as ulcerative colitis) are present (4).

The results have been quite satisfactory. In 572 cases of post-operative thrombo-embolic disease (in which further emboli might have been expected in 68 cases) only 1 minor embolism occurred and

none of the 16 deaths, which experience indicated might be expected, actually occurred. In 1,114 post-operative cases anticoagulants were used prophylactically with no emboli occurring and only 2 minor cases of thrombophlebitis being noted. In the group receiving prophylactic post-operative anticoagulants were 716 patients who had abdominal hysterectomy; in which experience indicated that 29 might be expected to have thrombo-embolic disease, and 5 might be expected to die. Of the entire group of 1,686 patients so treated, 73 lives had been saved, and 211 patients had been spared the additional discomfort and morbidity of thrombo-embolic disease. In the series treated with anticoagulants, 2 patients died of gastro-intestinal hemorrhage (both had had alimentary tract surgery, in one hemorrhage arose from erosion of a large artery by a concurrent duodenal ulcer) (3).

Other users of anticoagulants have had equally good results. Murray (15) in Canada, relying chiefly on Heparin, reports: (a) No cases of thrombo-embolism in 400 post-operative cases; (b) no pulmonary emboli in 371 cases of venous thrombosis; and (c) no deaths in 149 cases of pulmonary embolism (4 had subsequent minor emboli). Cosgriff and his coworkers (9) at Columbia-Presbyterian Medical Center in New York using combined Heparin-Dicoumarol therapy reported no deaths and only 6 subsequent emboli in 202 cases of thrombo-embolic disease and 1 mild venous thrombosis with no emboli in 51 post-operative cases treated prophylactically. Jorpes (11) in Sweden using Heparin in 258 cases of venous thrombosis reduced the mortality from 18 percent to 1 percent and the average stay in bed from 40 days to 4.6 days. All these users of anticoagulants stress the almost immediate reduction of incidence of thrombophlebitis after instituting anticoagulant therapy, and also a substantial reduction of the late sequelae of thrombophlebitis.

The Homans-Allen-Linton group at Massachusetts General Hospital have placed chief reliance in simple bilateral superficial femoral vein ligation (and thrombectomy) for specific treatment of existing thrombo-embolic disease as well as prophylactically in elderly patients (over 65) and other particularly susceptible groups who are to be bed-ridden for some time. Dicoumarol is used prophylactically in post-operative patients 40 to 65 years of age—but in rather small, infrequent doses (one 200 mg. dose repeated after 48 hours if “satisfactory prolongation of prothrombin time is not obtained”)—with 75 percent reduction of incidence of thrombo-embolism as found in corresponding untreated cases. However, in addition to this very cautious quantitative use of Dicoumarol, they list the following contra-indications to Dicoumarol therapy: liver disease; hypertension; chest surgery; hyperthyroidism; diabetes; arthritics receiving salicylates; excessive bleeding at operation; plasma prothrombin determination above 25 seconds; and pa-

tients 65 years of age or older. Their results from prophylactic and therapeutic femoral vein ligations (usually bilateral and just distal to the deep femoral tributary leaving no superficial femoral blind stump) are excellent. In 458 prophylactic ligations there has been one instance of fatal embolus (autopsy revealed thrombosis of an excessive proximal stump extending 3 cm. beyond the deep femoral vein) and 5 instances of mild phlebitic episodes; this is compared with a similar group of 458 unligated patients in which there were 55 cases of thrombo-embolic disease and 26 instances of fatal pulmonary embolism (1). In 1,060 therapeutic ligations fewer than 5 percent of the patients had subsequent emboli and only 5 deaths (4 were in patients over 65 years of age and occurred before 1943 when prophylactic ligations were begun). In this series of 1,518 patients the absence of evidence of clinical venous insufficiency in the prophylactic group of ligations and the subsidence and minimization of clinical acute and chronic thrombophlebitis in the therapeutic group is stressed (1) (2). In fact, this Boston group, as well as others (8) (18), now report that superficial femoral vein ligations are being done with excellent results in the late postphlebitic complications of ulceration and edema resulting from recanalization of the thrombosed vein and its destroyed valves (13). Also, in no case has vein ligation resulted in loss of life or limb (except in the case where an excessive proximal stump became thrombosed and released a pulmonary embolus with fatal result) (1).

It seems well at this point to mention a large group of well-known clinical observers who practice and recommend a more balanced approach to the thrombo-embolic problem. These physicians recommend all the usual prophylactic measures, such as sympathetic blocks to minimize the local effects of thrombophlebitis, anticoagulant prophylaxis in higher risk groups, and vein ligations above the involved vein segment (or thrombectomy) in all cases of phlebothrombosis and/or pulmonary emboli (6) (16) (17) (18). Actually the plan of the Boston school appears to vary from this only in that bilateral femoral ligations are performed by them for thrombophlebitis on the basis that most such cases will have a subclinical contralateral phlebothrombosis (2); and that prophylactic ligations in the elderly are performed routinely.

CASE REPORT

C. C. O., a 19-year-old male was admitted with the diagnosis of internal derangement of the right knee joint. On 31 January 1948 an arthrotomy and right medial meniscectomy, with control of bleeding assured by use of a pneumatic tourniquet about the upper thigh (pressure at 300 mm. Hg) during the operation, was done. The post-operative knee dressing was covered by an elastic bandage which was confined to the knee area. That night the patient had a moderate pulmonary embolism with symptoms of sudden severe pain in the midportion of the chest

followed in a few minutes by a cough productive of bloodstreaked sputum, a cold sweat, shaking chill, and tachycardia of 115. On the morning of 1 February 1948 his temperature began to rise and the right lower extremity was swollen and very tender up to Hunter's canal. A diagnosis of right superficial femoral thrombophlebitis was made. Under local anesthesia the right superficial femoral vein was ligated at its junction with the deep femoral vein (the vein at and above that level seemed to be free of thrombus; the excised small vein segment was found to be grossly normal). Penicillin therapy was instituted. By 2 February 1948 the swelling and tenderness of the right lower extremity were much reduced and the chest symptoms had disappeared, the temperature and pulse rate were still elevated. Although it was felt that the ligation was safely above the process and no dead venous sac was left, the additional use of anticoagulants was strongly advised because the deep femoral vein was still intact.

Continuous infusion of intravenous Heparin at the rate of 25 mg. per hour was given (no Dicoumarol was immediately available). A low-grade diurnal fever continued with the pulse remaining disproportionately high. On 4 February 1948 a 250 mg. initial dose of Dicoumarol was given and followed by daily doses of 200 mg. The Heparin was discontinued on 6 February 1948 although the prothrombin time on that day was reported as being only 61 percent of normal. On 9 February 1948 the patient had repeated epistaxes although the prothrombin time on that day was reported as 57 percent of normal (the lowest to date was 52 percent on 8 February). Each episode was temporarily controlled by cold compresses until the afternoon of 10 February 1948 when nasal packs were required to control the bleeding (prothrombin time, 59 percent). The Dicoumarol was discontinued, 10 mg. of menadione was given intravenously, and 60 mg. orally during the next 24 hours. On 11 February 1948 nasal bleeding was a slow ooze and finally stopped entirely (red blood cells, 3,300,000; hemoglobin 62 percent). By this time all signs of the thrombophlebitis had disappeared except for the slight diurnal temperature rise and increase in the pulse rate which continued until 16 February 1948. Thereafter the convalescence proceeded uneventfully. When the patient was discharged on 6 April 1948, the right calf and thigh each measured 1" larger in circumference than the left, but there was no dependent edema or other evidence of chronic venous insufficiency. At the 6-month postligation check-up on 16 August 1948 there was still no evidence of chronic venous insufficiency.

DISCUSSION

It is impossible to completely evaluate the two specifics used in this case. The vein ligation was almost certainly adequate to prevent further emboli (the fact that so many more predisposing factors for the production of venous thrombosis existed in the involved extremity than in the opposite one seemed to contra-indicate bilateral ligation) and also rendered postphlebitic chronic venous insufficiency unlikely. The 8 days of anticoagulant therapy is not usually considered adequate. Certainly the serious bleeding which occurred while the reported prothrombin time was still above 50 percent of normal indicated that the laboratory work so vital to proper anticoagulant therapy was less than dependable. It seems unlikely that this patient will suffer any undesirable results from his vein ligation, but rather that it may prevent the development of the undesirable postphlebitic leg.

This case emphasizes the problems peculiar to a small hospital, clinic, or private practice in which thrombo-embolism is rarely found. The result is that the operative experience for femoral (or occasionally intra-abdominal) vein ligations may be inadequate and the laboratory facilities for careful prothrombin time control of Dicoumarol therapy may be undependable. The physician finds himself in a dilemma. Because of its high cost and the, as yet, crude and painful mode of administration, Heparin alone will not appeal to many physicians. Because of the lack of a prothrombin time technique as dependable as that of the Mayo Clinic, the use of Dicoumarol will be sharply limited by many in the profession because of fear of hemorrhage. More and more the general surgeon will probably see fit to depend on his surgical skill and will perform vein ligations (particularly the relatively simple superficial femoral vein procedure described by A. W. Allen) therapeutically and prophylactically in the high risk patient. But chiefly the fact must be faced that a specific course of prevention of fatal pulmonary emboli must be adopted rather than the all too frequent expectant regimen.

SUMMARY

1. Vein interruption and anticoagulant therapy are the two chief sources of real reduction in mortality and morbidity from thrombo-embolic disease. It is shown that the results from both methods of management are about equal and that each is highly satisfactory.

2. Prothrombin time determinations are quite difficult to standardize. It is suggested that in small hospitals, clinics, and private practices surgical interruption of appropriate veins prophylactically in "high risk" patients, as well as therapeutically, should be the treatment of choice when prothrombin time determinations cannot be done dependably.

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Idiopathic Thrombophlebitis

Report of a Case

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DAVID L. MILLER, *Lieutenant, junior grade (MC) U. S. N. R.*

THE following case is presented as an example of an extremely severe idiopathic thrombophlebitis and as an instance of unusual resistance to Dicoumarol.

A 32-year-old white male was admitted to the Naval Hospital, Pensacola, Fla., 19 March 1948 complaining of crampy abdominal pains in the left lower abdominal quadrant of 24 hours' duration. He had been in good health until 2 weeks before admission, at which time he had a sore throat and fever. A few days after the onset of illness there occurred the "rupture of something" and the expectoration of a large amount of pus. Immediately after this episode he noticed pain, redness, and swelling around the left ankle. (The low grade fever continued.) About the same time he had a 1-day episode of vomiting followed by the passage of white stools, also lasting 1 day. Thereafter he passed two or three stools every day, darker and smaller in size than normal. These unusual bowel habits continued until the day before admission when he experienced an acute and moderately severe, crampy pain in the lower abdomen, most noticeable in the left lower quadrant. He spent an uncomfortable night and was admitted the following morning to an outlying dispensary and later transferred to this hospital. The dispensary noted pyuria, 1 plus reaction for albumin, and a leukocytosis of 17,500 with 55 percent polymorphonuclears. The patient also reported a mild burning sensation on urinating.

Past history was negative except for primary syphilis in 1936 which was treated with arsenicals and bismuth. He remained sero-positive and was retreated with mapharsen and bismuth early in 1945 and with penicillin in October 1945 but no change in the Kahn test reaction occurred. He also had a history of lymphogranuloma venereum in 1937. This was treated by excision of the lymph nodes in the left inguinal group.

Family and social histories were noncontributory.

Physical examination on admission revealed an obese white male complaining of severe abdominal pain. Temperature, 100.2° F.; pulse, 80, respirations, 18; and blood pressure, 136/94. The tonsils were moderately enlarged and cryptic but not actually inflamed. The chest was negative. The abdomen was moderately distended with marked tenderness in the left lower abdominal quadrant, extending into the left upper quadrant and across the upper part of the abdomen. There was some rebound tenderness. Bowel sounds were hyperactive but normal in quality. Rectal examination revealed some tender external hemorrhoids. Slight pain was described in both knees but there were no objective findings in the extremities.

In view of the urinary findings, a cystoscopic examination was done and only a mildly inflamed bladder was found. Because of increasing abdominal distention Wangensteen suction drainage was started although there was no other evidence of intestinal obstruction. About 10 hours after starting suction drainage he complained of severe pain in the right lower chest anteriorly with radiation into the back. He began coughing up bright red blood at which time physical and x-ray findings were compatible with a large pulmonary infarct in the lower lobe of the right lung. Heparin and Dicoumarol as well as oxygen and opiates were given. The abdominal pain was then presumed to be caused by a mesenteric thrombosis, but because of his serious condition laparotomy was deemed inadvisable. Three days after the first pulmonary infarction, another occurred, also in the lower lobe of the right lung. The following day he reported a painless swelling of the penis. At first the penis was observed to be erect, edematous, and pale. Later the same day he experienced excruciating pain and the glans was a deep violaceous color. He became anuric, confused, and disoriented. A Foley catheter was inserted and a small amount of urine was obtained. Later an unsuccessful attempt was made to aspirate blood from the corpus cavernosum. The white cell count rose to 35,000 with a predominance of polymorphonuclears and the appearance of a few young forms. Antibiotic therapy and sulfadiazine were started and fluids, papaverine, and aminophylline were given intravenously.

On 30 March the patient, for the first time, complained of pain in his legs, most marked around the ankles. The Achilles tendons were found to be tender. Several flat, hard, red, raised areas, varying from 3 to 6 cm. in diameter were noted on the lateral thighs and the right upper arm. He had no signs of deep thrombophlebitis and the dorsalis pedis and posterior tibial pulses were always strong. The prothrombin time was maintained between 30 and 40 percent but it was noted that daily doses of 200 mg. of Dicoumarol were necessary for this. On 7 April a roentgenogram of the chest showed a large cavity in the lower lobe of the right lung.

On 9 April there was tenderness along the deep leg veins and a positive Homan's sign bilaterally. The penis remained erect and appeared gangrenous and, on 20 April, a small draining abscess appeared on the shaft. The phlebitis was treated with warm, wet dressings and elevation of the affected parts. On 29 April there were painful, hot, red streaks up the left calf and thigh which were first thought to be evidence of lymphangitis but were found to be due to a superficial thrombophlebitis. At this time he was found to have a diffuse, ill-defined, hard, tender mass in the left inguinal region, extending over the iliac crest. Treatment with Dicoumarol was continued but in spite of daily doses of 300 mg. the prothrombin time remained above 75 percent. Treatment with this drug was discontinued on 10 May.

The patient improved steadily and was allowed to get up on 7 June with elastic bandages around both legs. The peculiar red areas on his legs and arms disappeared as did the mat of nodes in his left inguinal region. Serial roentgenograms finally showed complete healing of the lung abscess and only a thickened pleura remained from the two pulmonary infarctions. Venograms demonstrated normal superficial circulation in both legs and complete blockage of the return in the deep veins at the level of the popliteal space and the junction of the lower and middle third of the femur in the left and right legs respectively. Multiple urethral strictures were noted and treated. His libido, at first impaired, returned and he was finally able to experience intercourse without pain. Erection, however, still involves only the proximal penis. On 1 January all laboratory examinations were normal.

COMMENT

This case is considered to be an example of idiopathic thrombophlebitis or thrombophlebitis migrans. It followed the description given by Barker (1) who found the disease in young or middle-aged men, often obese, without evidence of constitutional disease, specific infectious disease, disease of the heart, of the blood or blood vessels, and without evidence of mechanical trauma. Most of Barker's cases showed a focus of infection; in this case it was the tonsils. Some (1) have considered the disease as a type of thrombo-angiitis obliterans without evidence of arterial disease. Sections of the affected veins have been found to show a histological resemblance to the arterial lesions in thrombo-angiitis obliterans. No sections were taken from the affected veins in this case and no abnormalities of the arteries were demonstrated by temperature or oscillometric studies. Recurrent attacks of the disease are said to occur in short segments of the veins, which may explain the several puzzling aspects in this case, particularly the peculiar red indurated areas on the arms and lateral thighs. Single attacks, however, tend to involve the large and medium-sized veins more than short segments of the smaller, superficial veins. Pulmonary infarction occurred in 30 percent of Barker's series of 79 cases. The question of whether the pulmonary infarction is due to embolus or to phlebitis of the pulmonary veins has never been settled.

In the literature on Dicoumarol therapy, references to resistance to the drug are rare. Yohr et al. (2) reported one woman, in a series of 76 cases, whose prothrombin time was never prolonged beyond 20 seconds despite a total dose of 2,100 mg. of Dicoumarol. Allen (3) states that occasionally patients require up to 300 mg. daily. From the beginning of therapy in our patient, it was noted that large doses of Dicoumarol were necessary to keep the prothrombin time in the desired range. The omission of the drug for even 1 day was followed by a rise in prothrombin activity to nearly normal. Finally, after 47 days of the therapy, he was resistant to even 300 mg. per day, three times the usual dose. The drug was being used in other patients at this time with expected results, so it was probably good stock. The prothrombin determinations also gave the expected results in other patients and the results of repeated estimations in this patient were consistent. Sulfonamides have not been found to inhibit the action of the drug (4) and respiratory infections have been observed to enhance its effect (5). Bleeding and coagulation times and platelet counts were normal in this patient. No explanation is offered for his unusual resistance to Dicoumarol. Of further interest is the possibility that increased prothrombin activity may have been an important etiologic factor in this case. Dicoumarol was started promptly after recognition of the first pulmonary infarction but, even

while getting fairly adequate results from the drug, he developed a second pulmonary infarction, thrombosis of the veins draining the penis, and thrombosis of both deep and superficial veins of the legs. We feel that the drug was beneficial in preventing even more extensive complications and that, if better effect on clotting had been obtained, some of the complications might have been prevented.

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Acute Lymphatic Leukemia in Childhood

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IT IS an accepted fact that most often leukemia in infancy and childhood is of the lymphatic type; this point is well illustrated in the report of the 28,401 admissions to the Children's Hospital of the East Bay during the past 10 years; 38 had acute leukemia, of which 37 were of the lymphatic type. This does not include several children with leukemia seen in the out-patient clinic who were not hospitalized. Out of the 38 patients autopsy was performed on 21. Sternal bone marrow punctures were done on 32 patients. Although leukemia in childhood is reputedly more common in males, the distribution in this group was 19 males and 18 females.

The classical instance of acute lymphatic leukemia in childhood is usually ushered in as some acute infection. The usual textbook description includes swelling of the tonsils, ulcerative angina, stomatitis, fever, hemorrhages, and a rapid anemia as the dominant features. The course is usually rapid and death may occur within a week after onset, more often in from 3 to 6 weeks. The diagnosis in patients with these symptoms is usually made with little difficulty. Unfortunately, we are frequently confronted with borderline cases in which great diagnostic acumen is required in order to establish a diagnosis. The total white blood cell count may be normal, increased, or reduced; and the differential count may range from normal limits to characteristic leukemic levels. Many patients may pass from one stage to another during the course of the illness, changing from an aleukemic to a true leukemic peripheral blood picture. This protean picture renders borderline cases diagnostic problems. Under the following clinical and laboratory headings certain points gained from this study may aid in the diagnosis of this disease.

Age and sex.—The average age in this group was 4 years 27 days, the youngest was 3 months and the oldest 10 years; 19 were males and 18 females.

Blood studies.—Arbitrarily adopting the figure of 10,000 white blood cells per cu. mm. as normal; 19 of the 38 cases were classified as true leukemia, 15 as aleukemia, and 3 were mixed. Lymphocytic cells

ranged from 60 to 100 percent, with atypical lymphocytes and prolymphocytes showing a wide variation—at times these were negligible and at other times rising as high as 50 percent of the lymphocytes. Blast cells were rarely seen in the early stages; in the terminal stages of the disease they appeared in large numbers (20 and 30 percent). “Basket cells” or degenerated cells usually varied directly with the leukemic lymphadenosis state. Nucleated cells of the erythrocyte series were observed to increase early and to persist throughout the disease; the more primitive forms appeared in the terminal stages. Platelet counts were universally depressed and this finding is a valuable diagnostic aid. Platelet counts were done on 27 patients; these ranged from 16,000 to 172,000 with an average of 67,300 per cu. mm. blood. Giant platelets were observed in all patients, being more prominent in those with markedly reduced platelet counts. Heterophile antibody tests done on 30 patients were all negative. Anemia was not a prominent feature in the early stages although it became progressive and severe in the final stages; the red blood cell counts dropped as low as 1 million with comparative low hemoglobin content. This feature alone is not a very helpful aid, except in the far advanced and easily diagnosed cases. However, in a borderline leukemia, a progressive anemia which does not respond to transfusions or other indicated therapy may be significant and a valuable diagnostic aid. Bone marrow (sternal) punctures were done on 32 patients; lymphocytic cells ranged from 30 to 85 percent of the cells with an increase in blast forms and prolymphocytes. Although counts in the peripheral blood frequently reached 100 percent lymphocytes, these cells in the bone marrow never exceeded 85 percent.

Physical findings—Lymph nodes and spleen.—Cervical lymph nodes were enlarged in 31 patients, 15 of whom also showed axillary, inguinal, or other lymphadenopathy. The spleen was palpably enlarged in 31 of the children.

Onset.—Acute lymphatic leukemia may first appear as any one of a number of ailments and may be long masked before the correct diagnosis is made. In our series the disease was ushered in and first became clinically evident in the following ways: fever and malaise in 8; anemia in 5; upper respiratory infections including otitis media, in 11; listlessness and anorexia in 7; and pains in the bones and joints in 6 (the latter may be presumed to be due to lymphatic infiltration, confirmed by roentgen studies).

Course.—It is impossible to ascertain with any degree of accuracy the exact time of inception of a disease process within the human body. This particularly holds true of leukemia in children. We have arbitrarily adopted the date of admission as the starting point to determine the clinical course of the illness, regardless of the entry



Figure 1.—Characteristic leukemic infiltration of heart and lung with hemorrhage.

diagnosis or the presenting symptoms. The shortest time a patient has lived after hospitalization was 3 days; the longest, 180 days, an average of 69 days.

Post-mortem examination.—

Autopsy was performed on 21. Classical findings were observed; the degree of leukemic infiltration in the viscera was variable. Lymph node enlargement was present in all but not to a marked degree. The spleen was enlarged in all cases, usually to tremendous proportions. It was our observation that leukemic infiltration in the lungs (fig. 1), kidneys (figs. 2 and 4), heart (figs. 1 and 6), liver, pancreas, adrenals, genital organs,

and the central nervous system (figs. 3 and 5) was almost always greater in the so-called aleukemic forms. The infiltration of these organs may help explain why some patients remain persistently aleukemic, so far as the peripheral blood picture is concerned.

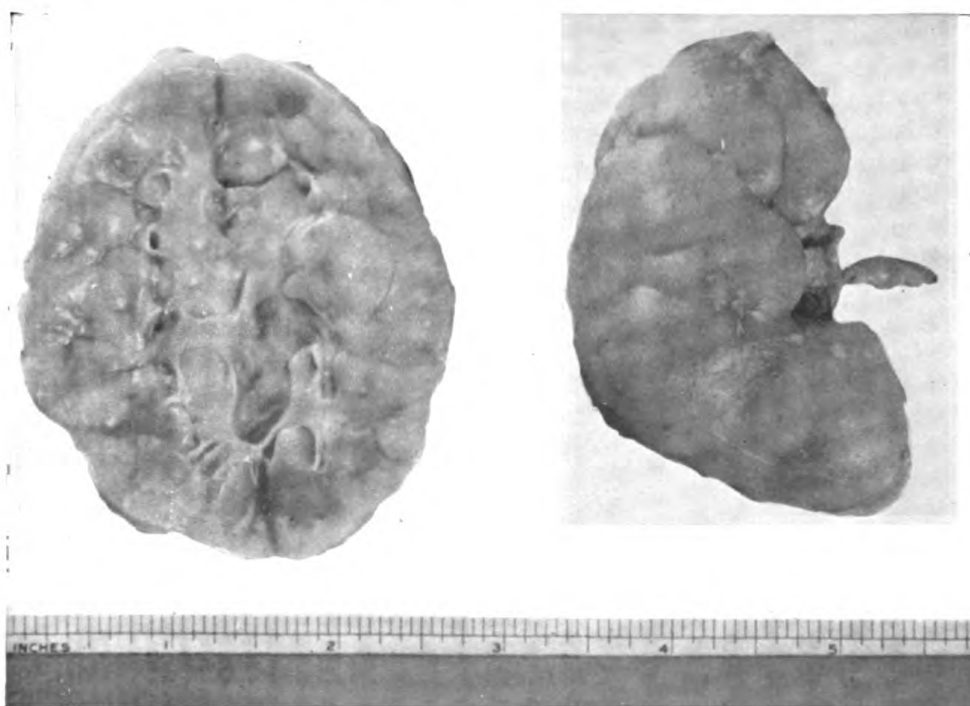


Figure 2.—Enlargement of kidney due to extensive leukemic infiltration.

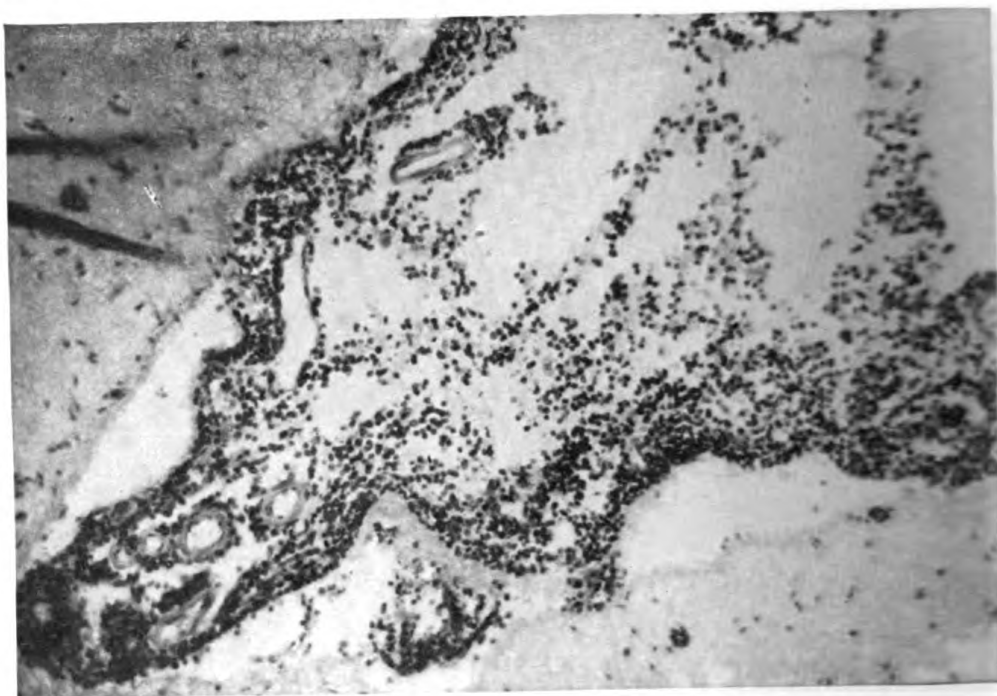


Figure 3.—Extensive leukemic infiltration into the meninges.

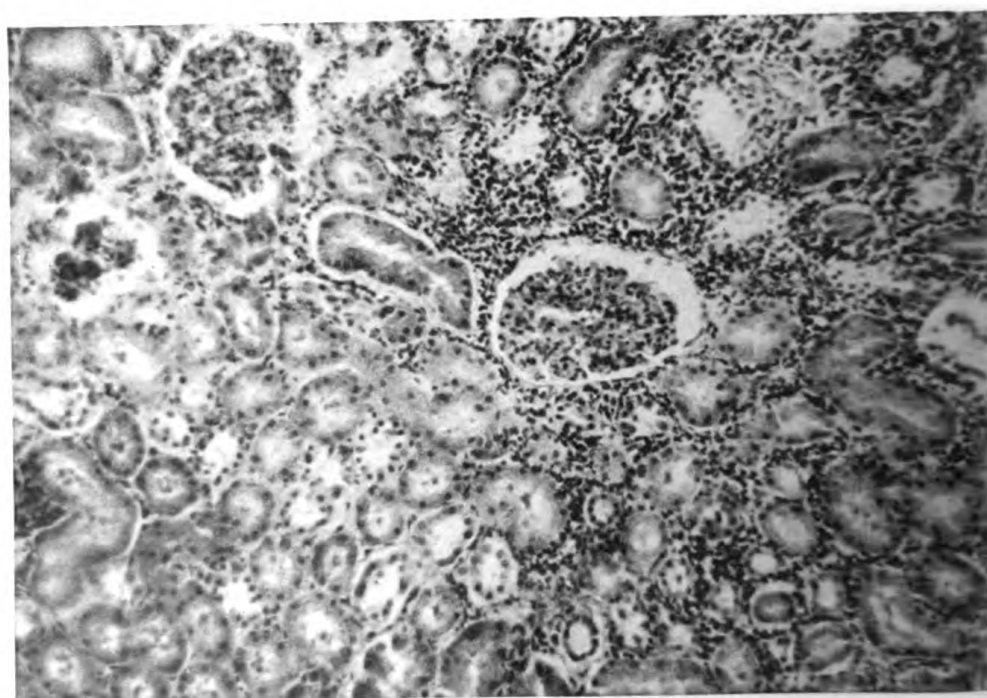


Figure 4.—Characteristic leukemic infiltration into the tubules, glomeruli, and intertubular spaces.

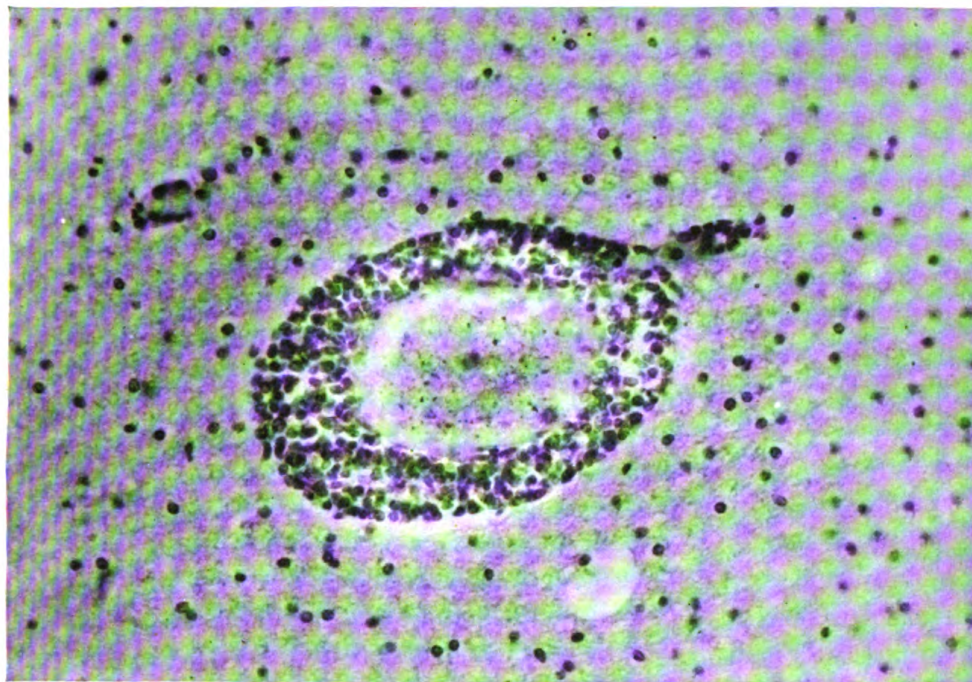


Figure 5.—Leukemic infiltration in the brain of a patient having marked cerebral symptoms.

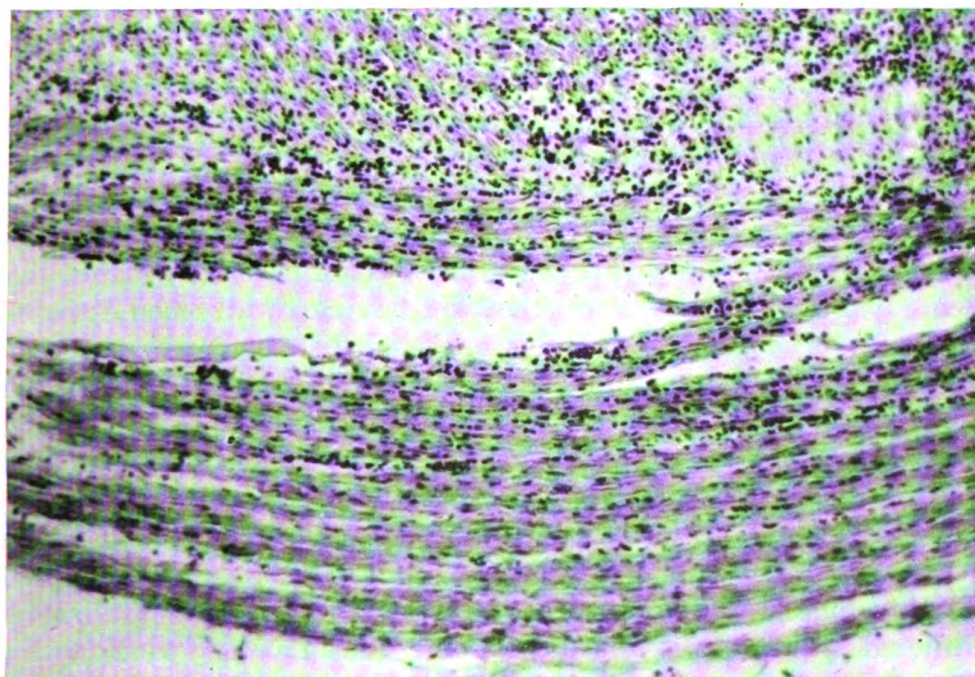


Figure 6.—Section of the heart muscle showing histologic evidence of leukemic infiltration between the myocardial fibers with marked degenerative changes of the myocardium.

Treatment.—We would like to emphasize that adrenal cortical extract is perhaps a valuable therapeutic agent. Its use in this form of leukemia has not been previously reported. Other treatment included the following: 20 patients treated with transfusions alone lived an average of 37 days before succumbing to the disease; 9 patients given transfusions and radioactive phosphorus (P_{32}) lived an average of 45.9 days (only 1 patient showed temporary clinic improvement through this therapy). It is our feeling that radioactive phosphorus is of little value in this acute form of leukemia. Penicillin is a valuable asset, as its use combats pharyngeal and other infections. Urethane, nitrogen mustards, aminopterin, and other agents were not used. Urethane is supposedly efficacious in the myeloid types of leukemia.

In 1945 a young child entered the hospital and a diagnosis of acute lymphatic leukemia was made after routine blood studies. Our attention was called at that time to two articles reporting the work done in the Institute of Experimental Biology at the University of California under the direction of Dr. Herbert Evans (1) (2) in which adrenal cortical extract was shown to depress the lymphocyte count in rats and dogs without depressing the erythrocytes or other elements. This patient was given (empirically) daily doses of 2.0 cc. of adrenal cortical extract. Blood studies, including platelet counts, were done at frequent intervals. The blood count showed a definite improvement with reduction in lymphocytes; the white blood count remaining around 19,000 per cu. mm. Despite this favorable response, the course was downhill and death occurred 3 months after hospitalization. The remarkable feature, however, was that the child showed none of the manifestations of angina such as ulcerative stomatitis, extreme purpura, and bleeding so characteristic of the terminal stages of this disease. Many years ago Sir William Osler (3) stated that acute lymphatic leukemia was the most terrible of all blood diseases: the suffering child and the distracted and distressed parents create for the physician one of the most disturbing phases of medical practice. Because of the encouraging results obtained in this first trial, adrenal cortical extract has been used in 7 subsequent patients with rather similar results. The hemorrhagic features of this disease have been wholly or partially controlled by this treatment in all the patients treated and many of the other symptoms have been modified. The average duration of life was 105 days after hospitalization although this figure is coincidental and is not intended to show that any curative or specific effect is obtained. The mode of action is certainly obscure and no theory is postulated as to its mode of action. We feel that its use should be continued and later evaluated after a wider clinical trial.

SUMMARY

1. Acute lymphatic leukemia in infancy or early childhood in this series of cases occurred at an average age of 4 years; the average life expectancy was 69 days after the diagnosis was established.

2. Blood studies in the early stage may not be diagnostic and subsequent serial counts must be done to establish the diagnosis. Platelet depression was found in all patients. Bone marrow studies are important diagnostic aids and should be done on all patients suspected of having leukemia.

3. The therapeutic agents so far encountered are of no value in the cure or arrest of the disease. Penicillin is an aid in combatting pharyngeal infections.

4. Adrenal cortical extract is introduced as a valuable therapeutic measure in alleviating many of the distressing hemorrhagic and ulcerative complications of the disease and its use is encouraged in order to obtain a proper evaluation of this form of supportive therapy.

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Infectious Neuronitis Complicating Infectious Mononucleosis

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THE SYNDROME described by Guillain, Barré, and Strohl (1) in 1915 has been variously designated by such names as neuronitis, infectious neuronitis, infectious polyneuritis, and Guillain-Barré syndrome.

The cause of infectious neuronitis is not known but it is thought to be a virus or the activation of a neurotropic virus (3). The syndrome has been known to be precipitated by or to supervene in systemic infections (4).

The cause of infectious mononucleosis is also thought to be a virus. The disease is usually sporadic but may occur in epidemics. It is not uncommon for systemic diseases due to virus infections to be complicated by cerebral involvement or for viruses to attack the central nervous system alone, as in rabies and acute anterior poliomyelitis. Benign lymphocytic choriomeningitis, also thought to be caused by a virus infection, has been reported to be associated with infectious mononucleosis (11) (12).

The complications and presenting signs and symptoms of infectious mononucleosis may often obscure the diagnosis. Read and Helwig (13) reviewed 300 cases of infectious mononucleosis in which the true diagnosis was given on admission in only 37 cases. Mitchell and Zetzel (14) emphasized that infectious mononucleosis is a protean disease, second only to syphilis in its ability to mimic other conditions. The case reported here bears out this fact in that the true cause was masked by the presenting signs and symptoms. The laboratory report of the routine blood smear gave the first suspicion that the patient had infectious neuronitis associated with infectious mononucleosis.

The onset in either of the two conditions is very similar. Both usually start with complaints referable to the upper respiratory tract and there is usually a headache of varying intensity. Tidy (11) has pointed out that in infectious mononucleosis with neurological manifestations, the glandular enlargement is slight. The glandular enlargement and the heterophile agglutinins may either develop after

the neurological symptoms have subsided or they may precede the nervous state. Our patient did not develop glandular enlargement until two days after admission and the spleen was never palpable.

A search of the literature reveals six (5) (6) (7) (8) (9) (10) previous cases of infectious neuronitis associated with infectious mononucleosis. Four of the patients survived and two died. The patient reported in this article made a rapid recovery although at one time his condition was critical.

CASE REPORT

R. E. D., an 18-year-old white male was first seen in a dispensary on 28 January 1948 complaining of generalized muscle weakness, diplopia, chills, and fever. On 19 January 1948 the patient was exposed while fatigued to extremely cold weather following a snow storm. A day later he noticed symptoms of a cold, with mild fever and marked lethargy. The following two days he noticed increasing lethargy, sleeping 12 hours at a time. Concurrently he noticed anesthesia, marked weakness of the muscles of the legs, clumsiness in walking, and double vision. He was then transferred to the U. S. Naval Hospital, Philadelphia, Pa.

Past history.—The patient stated that as a child he had had measles, chicken pox, whooping cough, and an ear infection with drainage. Two years prior to admission he had had a foot infection, resulting in chronically enlarged inguinal lymph nodes.

Family history was essentially negative.

Review of systems was negative.

On admission to the hospital the patient complained of generalized muscle weakness but he had no diplopia at the time.

Physical examination.—The patient was well-developed and fairly well-nourished but appeared acutely ill and was thrashing about in bed. Temperature, 98.6° F.; pulse, 100; and respirations, 22. He complained of extreme pain on motion of the extremities. The skin was smooth and warm. There was no rash or petechiae. The cranial nerves appeared intact except for weakness and pain on extreme lateral motion of the eyes. The voice had a "fuzzy" quality but not to a marked degree. The optic fundi showed the disks to be slightly hyperemic but they were well outlined and there was no evidence of increased intracranial pressure. The shoulder girdle and both arms were weak, especially the left. There was complete wrist drop bilaterally. The patient was unable to raise the trunk. On passive motion the neck was rigid. There was a bilateral Kernig's sign. The legs were weak and he had lost the power of dorsiflexion of the feet. The movement of the toes was minimal. Deep pressure elicited pain over practically all of the muscles. There was no respiratory involvement. Sensation was intact. The reflexes were hypoactive or absent throughout. The cremasteric reflexes were absent bilaterally. The abdominal reflexes were present but the left was considerably stronger. Pressure over the peripheral nerves was painful. There was a small tear in the left ear drum but no drainage. There were a few firm nontender lymph nodes in the inguinal region bilaterally. The spleen and liver were not palpable. The remainder of the examination was essentially negative.

A spinal puncture done at admission showed an initial pressure of 250 mm. of water; the fluid was clear but there was one drop of blood when the drainage

started; cell count, 7 lymphocytes and 25 red cells; proteins, 112 mg. per 100 cc.; sugar, 82 mg. per 100 cc.; chlorides, 700 mg. per 100 cc.; colloidal gold test, 5553332111; (spinal) Kahn reaction was negative. White cell count on admission, 15,800; differential count, juveniles, 2; segmented neutrophils, 19; eosinophils, 1; lymphocytes, 77; and monocytes, 1. The lymphocytes were of the type 1 Downy cells and the smear was reported as the type seen in infectious mononucleosis. Urinalysis was essentially negative.

Course.—The patient was treated with the Kenny technique. Sedation and prostigmine were also prescribed. The next day he remained afebrile and complained of a dull occipital headache; the paralysis of the extremities was more marked, and he complained of hyperesthesia of the buttocks, arms, and legs, and some sharp pains in the muscles of the abdomen. There was still no respiratory involvement. He was slightly more irrational and the pupils were dilated (probably because of the administration of atropine with prostigmine). Some slight sensory changes were noted in the left facial area. The left masseter was thought to be weaker than the right. No other cranial nerve involvement was noted. In the legs there was a loss of sensation to touch, and diminished positional or vibratory sensation. A repeat spinal tap was done and this showed slight increase in pressure to 150 mm. of water; no cells; 70 mg. protein per 100 cc.; and 88 mg. of sugar per 100 cc. The blood Kahn reaction was negative. Atropine was discontinued and the patient showed improvement of the mental symptoms.

On 31 January 1948 he was no longer able to bend the knees and there was some slight contraction of the quadriceps. There was a definite weakness of the left side of the face and the patient was unable to wrinkle the left forehead. There was a loss of positional sensation of the legs. The patient stated that there was more pain in the legs and arms and this was relieved only when hot packs were applied. The cervical lymph nodes became palpable for the first time and there were also a few small nodes felt in the axilla. The spleen was not palpable. The heterophile index was reported as positive, 1:7156. The white blood count that day was 11,600 with 39 segmented neutrophils, 41 lymphocytes, and 20 monocytes. On 3 February 1948 there was thought to be some slight intercostal involvement and the patient was placed in the respirator for 20 minutes every 2 hours as a precautionary measure. The intercostal involvement disappeared within 8 hours. On 4 February 1948 the patient showed weakness of the palate but otherwise his condition was the same. The next day the pain in the legs began to subside and on 6 February 1948 he noticed that he could move the fingers and that there was some return of the function of the thigh muscles and the internal rotators of the legs. On 7 February 1948 there was a definite return of function of the extensors and flexors of the fingers and wrists. A complete muscle test was done on 9 February 1948 and showed fair to good strength of the shoulder and upper arm muscles bilaterally, of the extensors and flexors of the hands, and of the muscles of the thighs. There was poor strength of the small hand muscles and there was no motion of the muscles of the distal part of the legs. Physical therapy and muscle reeducation was prescribed. His coordination was poor and his muscle return became slower with the gradual improvement in the function of all the muscles. The patient continued to improve. He began to walk with assistance, and coordination progressively returned. By 10 March 1948 he was able to walk without assistance.

DISCUSSION

In this case, it is impossible to say if the virus of infectious mononucleosis caused the syndrome described by Guillain, Barré, and

Strohl, or whether the syndrome was due to the activation of a distinctive neurotropic virus. It is possible that some of the cases of Guillain-Barré syndrome reported in the literature could have been associated with unrecognized infectious mononucleosis.

Infectious neuronitis is usually ushered in with muscle paralysis of the extremities. There may be a loss of sphincter control. The onset is similar to that of acute anterior poliomyelitis and must be differentiated from it. Infectious neuronitis usually affects the muscles bilaterally (15), although not necessarily equally, and usually involves the lower extremities first followed by involvement of the upper extremities. There is seldom any wasting of the muscle and the paralysis is flaccid in character. Fifty percent of the patients show sensory disturbances while 35 percent have facial paralysis occurring after the extremities are affected. Thirteen percent have other cranial nerve involvement. The syndrome is usually noted in persons between the ages of 20 and 55 but 25 percent of the cases have been reported in children under 20 years of age. It occurs sporadically and not in epidemics and occurs mostly in the cold months while poliomyelitis occurs in the late summer and early fall. The main diagnostic feature as emphasized by Guillain (16) is the so-called albumino-cytologic dissociation of the cerebrospinal fluid or, in other words, a high spinal fluid protein with a very low cell content. Guillain stated that the spinal fluid protein should be at least 300 mg. to be called a true Guillain-Barré syndrome although the spinal fluid protein may range from 70 to 800 mg.

The mortality rate is about 20 percent and death is usually due to the involvement of the intercostal muscles or the respiratory centers. In the patients who survive, recovery is usually rapid and spontaneous, with little if any residual paralysis. The duration of the patient's convalescence may range from a few days to three months.

The treatment is symptomatic. Our patient was treated with the Kenny technique. This gave him relief from the peripheral radiculitis. No benefit except the relief of pain is expected with this procedure. Vitamins should also be given; thiamin chloride 50 to 100 mg. daily intravenously with an appropriate dose of nicotinic acid. Sedation for the muscle pain and the radiculitis should be started promptly with a drug that does not affect the respiratory system. If there is respiratory involvement, which usually carries with it a more grave prognosis, the patient should be placed in a respirator.

Precautions must be taken to prevent foot drop, wrist drop, and external rotation of the legs. A bed board should be placed under the mattress.

Physiotherapy should be started as early as possible. The joints are moved through as complete a range of motion as possible, without

causing the patient extreme pain, increasing the amount of motion each time. When recovery begins and most of the radiculitis has disappeared, muscle reeducation can be instituted.

SUMMARY

The typical signs of infectious mononucleosis may not be present when a patient is first seen, and in cases with neurological manifestations the glandular enlargement may be only slight. In a patient with marked central nervous system involvement in which the cause is in doubt, a heterophile agglutination test should be done to determine if the condition is infectious mononucleosis.

The treatment of infectious neuronitis associated with infectious mononucleosis is symptomatic; convalescence may be shortened by the use of physical therapy and muscle reeducation.

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The Role of Carbohydrates in Dental Caries

GEORGE H. GREEN, *Lieutenant, junior grade (DC) U. S. N. R.*

UTIL recently little has been known about dental caries but today with modern scientific research and investigations, we are rapidly learning the facts about this widespread condition. Dr. Philip Jay (13) in his summary of the material presented at the University of Michigan Workshop on control of dental caries said "After listening to all of the material presented at this meeting, we should have little patience with the oft repeated phrase 'Little is known about the etiology and control of dental caries.' A great deal is known about both."

It is the purpose of this article to present a comprehensive view of some of the facts which are known today, emphasizing the importance of the role of carbohydrates in dental caries; the fact that about 95 percent of the population have dental defects points to the widespread incidence.

At 2 years of age, 50 percent of the children examined in recent studies had one or more carious teeth (10) (24) (19); by the time children reach school age, they usually have three; at the age of 16, nearly 75 percent of them have lost one or more permanent teeth, the average youth having seven teeth decayed, missing, or filled, with 14 tooth surfaces involved. Less than 50 percent of persons in the United States who are over 35 years of age have a usable number of natural teeth. Approximately 40 percent of the entire population have crooked, protruding, or other malformed teeth.

There is a backlog of half a billion cavities in the mouths of our child and adult population. Although adult Americans need a total of 144,000,000 dental services a year to meet current emergencies, exclusive of accumulated needs, only about 40 percent are met. If we had the manpower in dentistry to accomplish the treatment of these mouths, the cost would be about 5 billion dollars; ten times as much as Americans have ever spent in a peak year on dental care. It would require at least twice as many dentists as the nation now has to meet its annual dental needs.

On reading the literature to obtain information concerning the role played by carbohydrates in the production and control of dental caries, so many interrelated factors were found that mention of some of the more important facts seems necessary in order to present the subject in proper scope.

CARBOHYDRATE METABOLISM

Carbohydrates are either simple sugars or substances that form simple sugars when they are hydrolyzed. There are 3 types of carbohydrates; the monosaccharides, the disaccharides, and the polysaccharides (fig. 1). Each is of more and more complex molecular structure. However complex this structure, the digestive processes, starting with the salivary juices and ending with the ferments of the small intestines, break it down into a less and less complex one until they all terminate as monosaccharides and are absorbed from the intestine to become available glucose.

CHART NO. 1 CLASSIFICATION OF IMPORTANT CARBOHYDRATES		
CLASSIFICATION	EXAMPLES	SOURCE
MONOSACCHARIDES	GLUCOSE (DEXTROSE) FRUCTOSE MANNOSE	GRAPE SUGAR - CORN SUGAR FRUIT SUGAR - HONEY
DISACCHARIDES	SUCROSE LACTOSE MALTOSE	SUGAR CANE - SUGAR BEETS VEGETABLE KINGDOM MILK SUGAR CEREALS - MALT PRODUCTS
POLYSACCHARIDES	STARCH* DEXTRIN (CEREALS) CELLULOSE GLYCOGEN	*75% OF SOLID MATTER IN CEREALS AND POTATOES* APPLES ETC. - WHOLE WHEAT BREAD ANIMAL STARCH

Figure 1.

The functions of carbohydrates in the body are fourfold. By far the most important is the production of energy for work of the skeletal muscles and organs of the body. For this purpose energy is derived chiefly from the oxidation of carbohydrates and, to a lesser degree, from fats and proteins. From experimental work, it is estimated that approximately 65 percent of the necessary energy is derived from oxidation of carbohydrates. Another function of carbohydrates in the body is the production of heat. A third function is to aid in the neutralization of toxins to which the body is constantly subjected.

The fourth and final function of carbohydrates is to aid in the metabolism or oxidation of fats. It is said that "fats burn in a fire

of carbohydrates." The complete burning of fat into CO_2 and H_2O takes place only when carbohydrate metabolism is normal; otherwise an accumulation of intermediate or incompletely broken down fats such as acetone occurs, and acidosis is present.

Adequate carbohydrates should be readily available in the diet, and at the same time, excessive amounts of refined carbohydrates should be eliminated. There are many sources from which dextrose may be derived without using refined carbohydrates, since substances such as fructose, galactose, and starches are converted to dextrose before their absorption into the blood. Dextrose, therefore, can be derived from the carbohydrate content of many fruits and vegetables. For instance, an orange contains about 12 grams of carbohydrates and 1 ounce of green peas about 17 grams. Fifty-eight percent of all proteins are theoretically converted into dextrose and the glycerol fraction of fat, which ordinarily makes up 10 percent of its weight, is converted into glucose. Thus it is entirely possible to have normal nutritional requirements in diets which are designed to limit the growth of *Lactobacillus acidophilus* and consequently the development of dental caries.

ETIOLOGY OF DENTAL CARIES

Dental caries is caused by dissolution of the enamel structure of the tooth. Theoretically, a cavity may result from an attack on either the organic or the inorganic components of the enamel, from a combination of the two occurring simultaneously, or from one following the other.

It is known that the organic matrix of the enamel is destroyed as a result of proteolytic digestion, while the inorganic components of the enamel are destroyed by bacterial activity which causes the degradation of carbohydrates to acid.

There are two theories which have evolved from the above considerations. First, the acidogenic theory; that caries result from decalcification of the enamel and dentin caused by degradation of carbohydrate to acid, followed or accompanied by proteolysis of the organic matrix (29). Second, the proteolytic theory; that caries result from proteolysis of the organic substance of the enamel and that acid action resulting from carbohydrate degradation is a component of the process. These two components are not present in all cases in the same proportion (8) (9).

Thus it appears that acid formation is an important consideration in either of the two theories of tooth decay. These acids are formed in the protected areas of the mouth by a series of enzymatic reactions. Many enzymes, all of which are formed in varying amounts by the acidogenic micro-organisms of the mouth, and by certain co-enzymes,

many of which are found in an adequate diet, are involved in the process. By means of these reactions, acids are formed in every mouth, whether susceptible or immune to caries, if a suitable substrate is present. This substrate must be, in most instances, a fermentable sugar. If acids are formed with sufficient speed to overcome any natural oral neutralizing action, the teeth will become decalcified in the spotlike protected areas, and whether a cavity will develop depends on the balance between the speed of acid formation and acid neutralization.

As can be seen in chart No. 2 (fig. 2), there are three main ways in which the rate of acid formation and neutralization may be influenced: (a) through changes in the diet; (b) changes in the tooth; and (c) changes in the saliva. As shown in the chart, there are many factors which tend to alter each of these. Other factors which may have an effect are the endocrine glands, emotional states, and heredity.

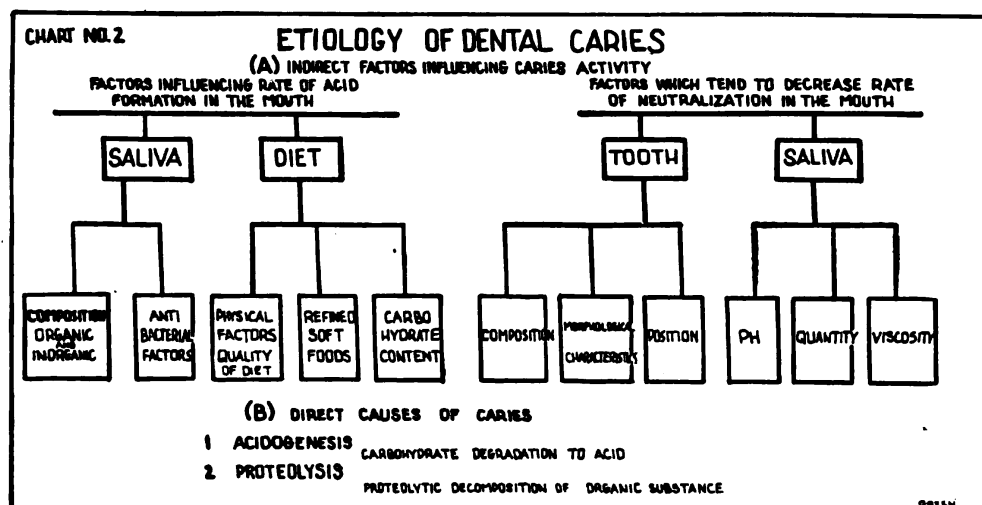


Figure 2.

Since the acidogenic and the proteolytic theories are the only two theories of dental decay generally recognized by authorities today, it will be interesting to see what role carbohydrates play in each of these two theories.

CARBOHYDRATES IN THE ACIDOGENIC THEORY

From the viewpoint of the acidogenic theory it is obvious that the only substrates from which acids can be formed are the carbohydrates. The monosaccharides and the disaccharides are the ones most likely to be converted into various acids under the conditions found in the mouth.

It has been shown that the mechanisms of acid formation in muscle tissue and acid formation in the oral cavity are analogous. Lactic acid formation during muscular activity is an extremely rapid process and acid formation in the oral cavity can be just as rapid if necessary enzymes and co-enzymes are present. It has also been pointed out (5) that organisms which normally occur in the mouth, particularly *L. acidophilus*, yeast, and many others, can accelerate many of the intermediate reactions in the breakdown of carbohydrates to acid. Although each pure-strain organism could not alone accelerate all the reactions, a symbiotic relationship of all of them can accelerate each of the intermediate steps. Therefore it is quite conceivable that acids are formed very rapidly following the ingestion of fermentable carbohydrates. In fact, it is claimed that the reaction takes place within 10 to 20 minutes after consuming such foods (26).

Stephan and Miller (28) and others found that dissolution of enamel occurred when the medium had a pH of 5.5 or less. Thus, if the concentration of acid resulting from bacterial fermentation of carbohydrates reached a pH of 5.5 or lower, it caused dissolution of the enamel. They found that rinsing the mouth with glucose solution lowered the pH of the plaque material to within the range of the critical index of caries. In a group whose plaque material had an average pH of 6.17, the glucose lowered the pH to an average of 4.93. The pH remained in the critical index for from 12 to 20 minutes.

In addition to providing the substrate from which the acids are formed, carbohydrates are believed to provide a growth factor for the bacteria which bring about the acid production (13). Also, undoubtedly the consumption of carbohydrates must produce a systemic effect on the caries process. The consumption of excessive amounts of carbohydrates causes a change in the saliva, which in turn makes a more favorable medium for the growth of the acid-forming bacteria. Carbohydrates, then, play an extremely important role in the acidogenic concept of dental caries; this concept is accepted by the majority of men working in this field.

CARBOHYDRATES IN THE PROTEOLYTIC THEORY

There are many who believe in the proteolytic theory of tooth decay. They contend that the organic substance is destroyed first, or at least simultaneously, with the acid decalcification. Carbohydrates are not quite as important to their concept as they are to the concept of those who believe in the acidogenic theory. However, they admit that the reduction of carbohydrates as a control measure in dental caries is certainly to be desired (9). Here, as in the acidogenic concept, the carbohydrates provide substrate for acid formation, a growth factor for the bacteria which bring about the acid production, and a systemic effect on these same bacteria.

Pincus (23), Nuckolls, and Gottlieb (9) state that the enamel is not a smooth solid covering, but shot through with numerous tiny canals or lamellae, which have no apparent function, and are weak spots or flaws in the enamel. They believe that these canals act as tunnels through which the agents enter the tooth and cause decay. This explains why a tooth which apparently does not have a break in the enamel may be only a hollow shell. If acid were the main cause of decay, the greatest amount of decay should be on the enamel itself. Actually damage is greater in the soft dentin, yet it is more resistant to the action of acid than enamel.

Although the bulk of scientific evidence seems to support the acidogenic theory rather than the proteolytic, the proteolytic theory cannot be disregarded.

SOURCE OF UNDESIRABLE CARBOHYDRATES

It has been demonstrated that an excessive amount of carbohydrates in the diet is an important factor in the production of dental caries. It should now be determined which carbohydrates are the worst offenders. In other words, which are likely to produce the greatest amount of acid in the least amount of time.

Of the three types of carbohydrates, the monosaccharides, the disaccharides, and the polysaccharides, the monosaccharides and the disaccharides are the most simple in structure, and therefore the ones which would be expected to be the most rapid acid formers. The polysaccharides, or starches, are more complex in structure, therefore they are not so readily converted into acid. In fact, in cases of widespread caries treated by carbohydrate restriction, it was found necessary to reduce both sugars and starches in only 10 percent of the cases; restriction of sugars alone gave desirable results in 90 percent of the cases (27).

Since starches can be converted to sugars, it seems that they would prove as important as sugars in the production of dental caries; but, although ptyalin in the saliva will convert boiled starch to sugar, it usually does not remain in the mouth long enough to be hydrolyzed by ptyalin. The food swallowed is thoroughly mixed with saliva and accumulates in the upper portion of the stomach. Here the ptyalin continues to act until the hydrochloric acid of the stomach has penetrated the mass and reduced its alkaline reaction to a point where the action of this enzyme is inhibited (around $pH4$). Since this often takes considerable time, a large portion of ingested starch may be hydrolyzed by this enzyme. This action rarely takes place in the mouth. In fact, if a large amount of unboiled starch is consumed, it is not utilized by the body at all, it merely passes through unchanged (4).

On the other hand, sugars can be rapidly converted in the mouth. It has been shown that fructose, glucose, and sucrose can cause a decrease of approximately 0.8 *pH* within a 5-minute period. By use of the antimony electrode for direct *pH* readings in the mouth. Stephan (26) was able to demonstrate in plaques very rapid production of acid from dextrose (glucose), fructose, maltose, and sucrose. Lactose produced much smaller *pH* changes, while cooked starch paste produced *pH* changes similar to maltose but more slowly when it was held in the mouth. Evidently ptyalin in the saliva converted cooked starch into maltose.

On the basis of these and other experiments (7), it is evident that fructose and glucose are most damaging, and that lactose is the least harmful. According to the theory of carbohydrate degradation fructose and glucose should be the most damaging. Fortunately these sugars are not found free in nature to any great extent, or in any very high concentration. In refined carbohydrates, however, we find a very high concentration of these sugars. Our chief concern, then, is not sugars found in their natural state, as in fruits and vegetables, but in their refined state (jams, jellies, candies, bakery products, and so forth).

Thirty-five years ago, Dr. H. P. Pickerill (22) of Australia wrote:

The prevalence of caries is due to the habitual consumption of "artificial" as opposed to "natural" articles of diet. Most of the forms in which starchy and sugary foods are taken at the present time can only be regarded as luxuries, and, moreover, as dangerous luxuries—at least, as dangerous as alcohol, for instance: and, like alcohol, they should be taxed. The manufacture of sweetmeats, confectionery, and fine white flour, should be carried on only in bond; and all such articles should be subject to Excise, either when manufactured at home or imported from elsewhere. The amount of the taxation should be sufficient to appreciably diminish the demand for such commodities, and the moneys so collected should be applied to the cheapening of other equally nutritious and less harmful forms of foods—not less harmful only, but actually preventive of dental disease. Particularly, the culture, carriage, freight, and importation of fruit and vegetables (and of meat in some places) should be fostered and aided, so that such articles may come (especially fruit) to be regarded as common, ordinary, and necessary constituents of every meal, instead of being, as at present, regarded as unnecessary and too expensive for common and constant use. Such legislation might well accord with a back-to-the-land or closer-settlement policy the desirability of which, on economic grounds, is so much advocated.

Along this line it is interesting to read in the Journal of the Illinois State Dental Association of November 1948 about the following action:

The Executive Council has authorized the preparation of a bill for the State legislature that would place a nominal tax on sugar for dental welfare purposes. The prime motive for the bill is to focus attention on the damage that high sugar consumption has on dental health and to raise funds for expanded research on methods for controlling dental caries. With six cavities forming

for every one that is filled and with sugar a major factor in caries production, the action the Society has initiated will bring beneficial results. (17)

Some of the most widely used refined carbohydrates are bakery and confectionary products, ice cream, and soft drinks. Approximately 11 billion bottles of soft drinks per year, containing 500 million pounds of sugar, are required to satisfy our craving.

It has been estimated that close to one-fourth of our energy requirements are supplied by sugar. From the nutritional standpoint, therefore, it would seem that sugar should be, of all foods, the most cautiously used in feeding children lest it displace too much the foods that supply proteins, vitamins, and mineral elements which they need for healthy growth and development. Instead of this, however, we are told today that our infants must have glucose and highly sweetened milk formulae; thus, in the early months and years of life a craving for sweets is established which in later life requires 140 pounds per year to satisfy. This is based on recently reported figures from the Department of Agriculture which indicate that within the next year our population will consume 8,500,000 long tons of sugar; each resident will eat annually practically his own weight in sugar, a daily average of 28 teaspoons of sugar. Hygeia, published by the American Medical Association, states that the maximum allowances of sugar for one day should not be more than 6 teaspoons. Some candy bars contain as much as 13 teaspoons of sugar, while an average piece of iced chocolate cake or cherry pie may contain as much as 15 teaspoons of sugar.

The use of white flour and similar refined starches is also believed to play an important role in the production of caries. Since certain important factors, such as water-soluble vitamin B and C, have been removed in the refining process, subclinical and clinical entities such as pellagra and scurvy have appeared. Also the concentration of starches and sugars results in the loss to the individual of large amounts of cellulose, which furnish roughage.

METHODS OF CARIES CONTROL

In the control of dental caries, the adoption of a low-sugar diet is one of the best and most direct methods which may be recommended (fig. 3). The Michigan group (12) found that by reducing sugar alone in the diet of some cases, and sugar and starch in others, depending on the degree of caries susceptibility, the salivary *acidophilus* may be reduced to very low counts or zero, and in these cases dental caries is completely arrested. Large groups of children in orphanages were observed over a period of several years, during which they were fed extremely low sugar diets; many of them developed no new cavities and previously unfilled cavities grew no larger.

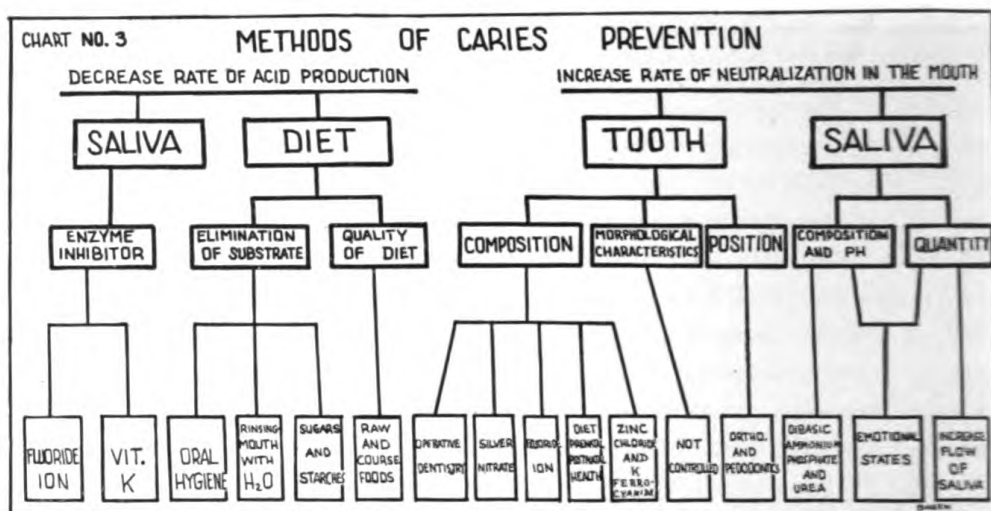


Figure 3.

Many claim that an adequate diet which meets the nutritional requirements of the body will serve to prevent dental caries. The Iowa School (25) stresses the point that an optimum diet will usually cause a reduction in caries. The arrest of caries in these children could not be attributed to the excellence of their diet; the lower than average sugar intake was the only discernible factor which could be related to the control of dental caries.

The Michigan School (12) also has evidence of unusually low caries incidence in groups of children on diets low in sugar and deficient in vitamins A, C, and D, and in calcium and phosphorus.

The difference between these two groups is not as great as it seems on the surface. The elimination of sweets may bring about an increased use of other foods, and again the inclusion of a variety of whole foods may tend to decrease the use of sweets. If the Iowa School "optimum diet" is analyzed, we find it is essentially a sugar and starch free diet.

Tests were painstakingly done, on 3 groups of 122 students each. Records were kept of diets of all of them—one group was caries-free (at start), another had unchecked caries, and the third had questionable caries activity. The findings showed a striking correlation between the presence of *L. acidophilus* in saliva of those with caries and absence of *L. acidophilus* noted in those free from caries (18).

Analysis of food intake of all 366 students showed clearly that these essential vitamins were not more deficient in those with unchecked caries than in the caries-free group, and not more abundant in the caries-free group than in the other groups. Therefore, on the basis of nutritional adequacy, or any concept of a so-called optimum diet, no

one group was superior to the other, and yet one developed caries, while the other remained caries-free. It appears doubtful that caries can be influenced by increasing certain food elements as advocated currently.

Many dentists are now controlling caries in children simply by withholding sugar from their diets. In some highly susceptible cases, however, this alone will not stop the disease, and in them it is necessary to reduce the starch intake as well. The efficiency of these measures can be determined by making salivary *acidophilus* determinations to see whether the counts are definitely reduced.

Becks (1) in 1937, conducted a series of studies which showed that there is a definite relationship between the presence of carbohydrates in the mouth and the growth of *L. acidophilus*.

In 1,004 (81.7 percent) of 1,228 cases of unchecked dental caries a reduction of the *L. acidophilus* index was obtained within a period of a few weeks by reducing the intake of refined carbohydrates and replacing the calories derived from these foods by increasing the intake of meat, eggs, vegetables, milk, and milk products. The comparatively small remaining group either were uncooperative or else were influenced by undisclosed factors. This high degree of success established the reduction of the intake of refined carbohydrates as at least one effective means of reducing the *L. acidophilus* index.

It was also shown (2) that *L. acidophilus* is consistently present during caries activity and absent during caries inactivity. Another observation was that the reduction of a high *L. acidophilus* count was accompanied by a reduction in dental caries frequency. These observations establish the definite relationship between the reduction of the *L. acidophilus* index and the reduction of dental caries activity.

From the experience gained in the last five years, it has become evident that a program of dental caries prevention based on *L. acidophilus* indices and corrective procedures could be entirely practical and effective in private practice, institutional work, and the Public Health Service. Even though the introduction of the laboratory procedure in individual private offices may not be economically feasible as yet, the establishment of clinical laboratory facilities in certain centers could make such a service readily available to a large surrounding area. It is encouraging to note that some state health departments already offer this laboratory service. One of the distinct features of this test is that analysis of the sample can be delayed for several days after it is taken, permitting transportation across country if necessary. The entire procedure wherever applied need not interfere with other routine treatment because it can be accomplished within a few minutes. The effectiveness of correction can be determined within a week, and the time, effort, and cost of these preventive procedures are only a fraction of those necessary for repair.

As shown in chart No. 2, many other methods of caries control are available today. The use of detergent foods is one which might well be combined with a restricted carbohydrate diet. It has been a common observation but these foods, which act as cleansing agents in the mouth, actually clean the teeth more efficiently than the toothbrush. Although difficult to measure, it has been shown by Knighton (20) that the number of oral bacteria were reduced after the use of chewing gum, apples, paraffin, oranges, and other such foods.

Of course, the need of an adequate, well-balanced diet during the pre- and postnatal development of the teeth cannot be overemphasized. The proper care and maintenance of the deciduous teeth along with orthodontic treatment for malposed teeth is valuable in preventing cavities. It has been claimed that proper care of the deciduous teeth would prevent 40 to 45 percent of the dental ills encountered in later life.

Another method is the topical application of sodium fluoride (21) (3). The fluoride ion has an affinity for calcified tissue. In the enamel it converts the normal hydroxyapatite of which enamel is composed, into a fluorapatite which is one of the most insoluble of the calcified tissues (4). The American Dental Association recommends that dentists use this procedure routinely on all children. On the average, it has been shown to reduce additional decay by 40 percent. Other means of utilizing sodium fluoride are being studied and it is hoped that methods such as fluorination of public water supplies may prove practical in the near future.

Dr. Gottlieb, who is an advocate of the proteolytic theory, has developed a method of topical application for the prevention of cavities which is similar in some respects to sodium fluoride applications (9). He has tested his method for several years and claims that his impregnating treatment is 90 percent effective as compared to fluorine which is only 40 percent effective; he recommends two solutions; the first is 40 percent zinc chloride, followed by a solution of 20 percent potassium ferrocyanide. A chemical reaction takes place which penetrates the entire length of the lamellae. This treatment has been tested and is well supported by the results.

Dr. Kesel (15) has found that a dentifrice containing dibasic ammonium phosphate and urea will produce very beneficial results in the reduction of dental caries. The Council of Dental Therapeutics of the American Dental Association has approved for clinical trial a product containing these active ingredients.

The use of vitamin K (6), or Menadione, promises to be an effective preventive measure in the near future. This has been incorporated in chewing gum, although chewing gum contains some carbohydrate, it also stimulates the salivary glands, thus neutralizing any acids that

may be present. Chewing gum is also a good cleansing agent and 98 percent of the gum on the market today contains calcium carbonate, which has been found to reduce dental decay.

Routine scaling and polishing of the teeth is of positive value in preventing both dental caries and periodontal disease. Toothbrushing (11) can certainly be very beneficial in controlling the caries process. In order to be effective, however, the following requirements must be fulfilled:

1. The toothbrush must remove the food debris immediately after eating. Stephan and Fosdick have independently demonstrated that acid production occurs almost immediately after food has reached the bacterial plaque. So toothbrushing must be done immediately after eating to be very effective. As Knutson pointed out, such a procedure will probably never receive the sanction of authorities on etiquette.

2. Toothbrushing, to be effective, must be done thoroughly. Casual brushing of exposed surfaces of enamel, already cleansed by excursion of food, will not prevent or reduce interproximal or pit and fissure caries. Gottlieb mentioned that the Charters' method of toothbrushing is the correct one to use "from the caries viewpoint," but it is admittedly a time-consuming, tedious task to brush all surfaces of all teeth. A study made by Robinson suggests that the average young adult spends about 67 seconds in brushing his teeth. Certainly this is not enough time to allow thorough cleansing of each interproximal surface (11).

SUMMARY

For the control of dental caries, prevention is needed. Systems of inspection and advice are good and necessary, but in themselves are futile and almost useless in stemming the tide of this national disease. No expenditure of public money for the treatment can be justified, unless that treatment strikes at the cause of the trouble, and gives some reasonable hope that the incidence of the disease will be materially lessened.

Carbohydrates are a needed item of food, and a lack can cause acidosis. However, it is also possible to eat too many carbohydrates and if carbohydrates are consumed at the expense of necessary proteins and fats, malnutrition results. The present rate of consumption, over 140 pounds of sugar per year per person, presents the dangers incident to overeating.

The role of carbohydrates in the production of dental caries is found to be important in both the acidogenic and proteolytic theories.

Dental caries activity can be reduced 70 to 90 percent by the adoption of low sugar diets.

The topical application of sodium fluoride can also reduce dental caries 40 percent. Proper oral hygiene, the use of dibasic ammonium phosphate and urea, along with the caries control methods previously mentioned, should eventually check this widespread condition.

The use of a controlled carbohydrate diet is one of the best methods now available to prevent tooth decay.

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Potassium: A Clinically Significant Element

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POTASSIUM is an element of great clinical importance but its role in mineral metabolism and therapy is not as well known as that of sodium. That the clinical role of potassium is not fully appreciated is attested by the fact that few general hospitals are equipped to do laboratory estimations of serum potassium levels.

Potassium is one of the basic elements of the blood and tissues, and with sodium, calcium, and magnesium makes up the total base and the total electrolyte content of the body fluids. In humans potassium is the predominant base within the blood and muscle cells, whereas sodium is the important base in the blood serum. Potassium can be replaced to a limited extent by sodium, but sodium cannot be replaced by potassium without fatal results. Although the physico-chemical properties of both sodium and potassium are similar, the respective roles they play in the body are remarkably different.

Potassium (concentration ranges from 16 to 22 mg. percent, or 4.5 to 5.0 milliequivalents), sodium, and chloride control and maintain water balance and distribution, osmotic equilibrium, and acid base balance. However, sodium and chloride play the major part in pH control as shown by the Henderson-Hasselbach equation.¹ The total base concentration per unit of water in all tissues of the organism remains constant. Retention of base entails retention of water, and conversely accumulation of water is associated with storage of base. This fact has come into the clinical foreground today. When extra-cellular fluid changes occur, the base involved (retained or lost) is chiefly sodium; when cellular fluid changes occur, the base involved is chiefly potassium.

Another important function of potassium is the maintenance of normal muscle irritability and function predicated on a balanced proportion of sodium, potassium, and calcium for proper muscular action; this effect is also exerted on the cardiac muscle.

¹ $pH = pK + \text{Log } \frac{\text{base}}{\text{acid}}$, which concerns the regulation of the pH of the blood.

Potassium plays a part in maintaining normal osmotic equilibrium. The maintenance of this osmotic pressure depends primarily on the total base content in both the extracellular and the intracellular fluids.

Two types of potassium disturbances are recognized clinically; the hypopotassemia syndrome, and the hyperpotassemia syndrome. These clinical syndromes have not been generally recognized and probably have accounted for death in some cases. These disturbances may occur in certain conditions and a knowledge of them and an alertness in their detection may prevent the development of these dangerous states.

HYPOPOTASSEMIA

The hypopotassemia syndrome usually occurs when the critical potassium level of two milliequivalents per liter is approached. It may be recognized by the following signs and symptoms: (a) A short period of restlessness, followed by generalized weakness and hypotonia; (b) muscular paralysis, particularly of the diaphragm and respiratory muscles; and (c) electrocardiographic abnormalities; sagging of the ST segments, flattening or inversion of the T waves, prolonged P-R interval, and even arrhythmias, such as bigeminal pulse rhythm (resembles digitalis toxicity).

These symptoms have also been observed in chronic potassium deficiency in experimental animals (1).

Conditions which may bring about this syndrome are: (a) Abnormally low intakes of potassium; (b) parenteral administration of large quantities of solutions containing only sodium chloride and/or dextrose; (c) increased rate of excretion of potassium following the injection of desoxycorticosterone acetate (2) (3) (4) (5); (d) the polyuric phase of uremia of chronic nephritis and of lower nephron nephrosis; (e) chronic diarrhea (especially in infants); (f) severe ulcerative colitis; (g) cholera; (h) hyperthyroidism; (i) continuous gastric suction (gastric secretions contain $2\frac{1}{2}$ times as much potassium as the blood serum; vomitus contains 5 times as much); (j) sprue (occasionally); (k) familial periodic paralysis; and (l) insulin-treated diabetic coma.

Particular attention must be given to the toxic nephrosis which occurs in poisoning with carbon tetrachloride and with the decontaminating agent DANC in which either hypopotassemia or hyperpotassemia may occur.

Darrow (6) believes that the hypopotassemia syndrome may occur with a normal serum potassium because of the release of potassium from the cells in such states as dehydration, circulatory collapse, and anoxia; and that a diagnosis of potassium deficit requires a determina-

tion of the losses of body fluid or a measurement of the retention during recovery. He therefore stresses the importance of clinical recognition of the condition when paralysis, muscular weakness, and atonic muscles are present. Enlargement of the heart and myocardial failure are also suggestive signs. Recognition of the conditions likely to be associated with this disturbance is most important.

The disturbance in electrolyte balance when large amounts of saline solution are administered is not often appreciated. As noted previously, it is impossible to replace deficits of intracellular electrolyte with sodium and chloride alone, since both intracellular and extracellular electrolytes are involved in many, if not most, disturbances in body water and electrolytes (6) (7). The parenteral administration of large amounts of isotonic fluid is followed by diuresis and loss of serum potassium as well as sodium (8), or else by pulmonary edema; these facts (usually not taken into account in clinical practice) account for some of the deaths on surgical services. Parsons (9) has recently reported this occurring after a pancreatectomy.

The most feasible solutions are those recommended by Darrow (6) and Thorne (10); their use would prevent as well as correct the disturbances following potassium deficit. These solutions are listed in table 1. In cases in which there is complete dependence on parenteral solutions, the addition of 0.04 percent of potassium will probably prevent the development of a low serum potassium.

TABLE 1.—Solutions recommended to be used parenterally for correction of electrolytic disturbances

Potassium Phosphate ¹ solution (10):

K ₂ HPO ₄	gm.....	2. 0
KH ₂ PO ₄	gm.....	0. 4
Glucose.....	gm.....	60. 0
H ₂ O q. s. a. d.....	cc.....	1, 000. 0

Potassium-Magnesium-Calcium ² solution (10):

KCl.....	gm.....	1. 8
MgCl ₂	gm.....	0. 5
CaCl ₂	gm.....	0. 6
Glucose.....	gm.....	15. 0
H ₂ O q. s. a. d.....	cc.....	1, 000. 0

Parenteral ³ solution (6):

NaCl.....	gm.....	4. 4
KCl.....	gm.....	2. 7
NaHCO ₃	gm.....	4. 0

¹ K=2.5 meq./L; and P=14 meq./L.

² K=24 meq./L; Mg=11 meq./L; and Ca=11 meq./L.

³ Na=122 meq./L; K=35 meq./L; and Cl=102 meq./L.

The procedure in administering these solutions is well described in other articles (6) (10).

Clinical interest in potassium metabolism in diabetes was stimulated by Holler's (11) description of electrocardiographic changes noted in association with low serum potassium, occurring in a patient during therapy for diabetic coma. Recently, Nadler et al. (12) have studied

the electrocardiogram and, like Holler, they found that changes in the duration of electrical systole, alterations in the amplitude of the T wave, and the presence or absence of a U wave were reliable guides in forming an approximate estimation of the serum potassium level. The criteria of differentiation of the Q-T changes in the electrocardiogram due to hypocalcemia from those of hypopotassemia have been elicited by Erstene and Prondit (13).

HYPERPOTASSEMIA

Hyperpotassemia is probably quite as common as acute potassium deficiency. It occurs (notably in those states where there is an increased intake or retention of potassium) in uremia due to chronic glomerulonephritis or the lower nephron nephrosis, in the alarm reaction of Selye, and in Addison's disease. Recently Kempner (14) has cautioned about the development of the symptoms of increased potassium with the use of the rice diet. •

In uremia, the increase of potassium in the body fluids results from the break-down of body cells and the inability of the body to store potassium in any considerable amount or to excrete it by any channel other than the kidneys. Hoff et al. (15) believe that hyperpotassemia is the cause of death in uremia.

Since the symptoms resemble and simulate those of the hypopotassemia syndrome, it is necessary to do frequent serum potassium determinations.

The electrocardiogram is characteristic in the hyperpotassemia syndrome and shows interesting changes which may be correlated with the serum potassium level. Abnormally tall T waves and arrhythmias are some of the characteristic abnormalities. The tall T waves are to be differentiated from those Dressler (19) described as early signs of coronary infarction; in the former they are tall and narrow and in the latter tall and broad. Intraventricular and auricular conduction disturbances are seen at later stages of the syndrome. The changes are identical with those reported in experimental potassium poisoning (16) (17) (18).

These electrocardiographic findings are present in practically every case of uremia (20) (21) (22) (23) (24). The electrocardiogram in uremia is really a composite of the effect of a high serum potassium level and also a low serum calcium level (24). The hypocalcemia prolongs the systole, which is even more noticeable with the tall narrow T waves of hyperpotassemia.

The condition of hyperpotassemia may progress to auricular standstill, ventricular standstill, or fibrillation. The great majority of patients in the terminal stages of uremia show such cardiac dysfunction in the electrocardiogram. It has been estimated that potassium

poisoning is responsible for approximately 20 percent of the deaths of uremic patients (24).

TREATMENT

The treatment of increased serum potassium levels is rather difficult. Its presence in uremia indicates a poor prognosis. For this reason great caution must be exercised to avoid the inclusion of potassium in the diets of patients with renal insufficiency of chronic nephritis or in patients with adrenal insufficiency. When the hyperpotassemia syndrome is due to Addison's disease, it can be corrected by the administration of desoxycorticosterone acetate. Whereas in the anuric or oliguric phases of uremia, it is possible that any measures that produce diuresis and a lowering of the serum potassium level, would correct the danger.

The routine forcing of fluids in anuria or oliguria is dangerous because the regulators of body fluids, the kidneys, are impaired. In considering treatment it must be remembered that 70 to 75 gm. of protein a day will be broken down to supply caloric needs in those patients who cannot take food by mouth. For the rest of the caloric requirements about 200 gm. of fat will be burned in the body. From this catabolism about 250 cc. of water results and approximately another 250 cc. of preformed water is already present. Likewise as a result of catabolic processes nitrogenous substances, ketone bodies, potassium, sulfate, and phosphate accumulate in the body. It has been calculated that the oxidation of 45 gm. of protein will yield 135 cc. water, 7 gm. of nitrogen, 20 milliequivalents of potassium (10.7 gm.) and 0.5 gm. of phosphorus. Since there is also a 1,000 cc. loss of water daily through insensible perspiration through the lungs and skin a water deficit of 500 cc. per day occurs. The accumulation of the metabolic products and the negative water balance leads to acidosis, to increased osmotic pressure of the extracellular fluids, and dehydration of the cells.

As recent studies of electrolytes have shown, the great error in treating hypopotassemia is to give isotonic electrolyte solutions parenterally; this will only allow the situation to continue. Hypotonic solutions are definitely of value to replace the water loss and to keep the concentration of the electrolytes constant. Likewise the administration of 100 to 150 gm. of dextrose per day will diminish the protein destruction by about half (25) (26) (27).

The treatment of renal insufficiency resolves itself into administration of fluid in accordance with the above remarks. Thus no more than 1,000 cc. of 15 percent dextrose in distilled water should be given when anuria and oliguria are present. If there is much vomiting, 300 to 500 cc. of normal saline may be added. Electrocardiograms

and estimations of serum potassium levels should be done every other day, at least, in order to detect signs of potassium intoxication.

After the anuric stage and when marked diuresis occurs, it then becomes a question of sodium balance and fluids can then be given for replacement without much danger.

Also, in uremia the use of peritoneal irrigation or intestinal irrigations may be considered, but these are considered of little value, in fact Muirhead et al. (28) have shown that peritoneal irrigations can add to the difficulties. Proper concentrations of electrolytes must be used in the irrigating solutions, otherwise the procedure will not be successful.

It is exceedingly difficult to impress these principles of fluid therapy upon hospital staffs. The great error is to force fluids on patients with poor urinary output and the subsequent development of pulmonary edema results in death. Patients who have been treated in accordance with the basic principles outlined have done very well while serious results or death occurs in those treated without adherence to these principles.

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Toxemias of Pregnancy

Their Symptomatic Nomenclature

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THE classification of toxemias of pregnancy of the American Committee on Maternal Welfare has been more or less generally accepted (1). Since then a real effort has been made to distinguish between those toxemias occurring in patients with pre-existing hypertension or renal disease and those toxemias of late pregnancy occurring in the absence of other identifiable pathologic process. Titus (2) has discussed the problem of classification of the toxemias of pregnancy and pointed out the principal inadequacies of this division. Since the clinical picture presented by many patients in the first group is indistinguishable during pregnancy from the true toxemias (pre-eclampsia and eclampsia), and since all cases have certain fundamental features in common, it seems proper to speak of these conditions as the "pseudotoxemias."

It should be emphasized that the term "toxemia" has been used to describe a syndrome and not to designate a particular disease entity. The characteristic triad of the syndrome is hypertension, edema, and albuminuria. Hypertension and albuminuria are always present and edema almost always; other signs and symptoms are variable. The purpose of this article is to attempt to correlate the definition of toxemia with a possible cause.

In general, essential arterial hypertension is not a serious complication of pregnancy. Typically, the blood pressure tends to rise somewhat during the first trimester. This is followed in some cases by a fall to normal levels in the second trimester, with elevation again in the third trimester (3) (4). The secondary fall is not constant in these patients, but it is important from both the diagnostic and prognostic standpoints. Diagnostically, if the patient is first seen during the normo-tensive phase and she later develops toxemia, she would be placed in the true pregnancy toxemia group. A careful postpartum evaluation would probably reveal the correct diagnosis but this is too often omitted. More important, however, is the prognostic aspect. In a large series of cases it was found that there were no stillbirths attributable to hypertensive toxemia when there had been a fall of

blood pressure during the second trimester and also that in every case in which a child was stillborn there had been no fall in blood pressure during that period of pregnancy (3).

Not all patients with essential hypertension develop toxemia. The incidence is variously estimated as 3 to 15 times the figure for normal pregnancy (3) depending in part, at least, on the criteria for the diagnosis of hypertension. However, patients with hypertension should be observed with more than average care, and treatment should be begun at the first sign of toxemia. Usually the symptoms are fairly easy to control, sedatives and rest being most important. Occasionally, severe toxemia occurs and interruption of the pregnancy may be indicated, since under these circumstances prognosis for both mother and baby is poor (1) (5).

Remote maternal effects from a hypertensive toxemia are probably due almost entirely to the continued marked elevation of blood pressure. Rarely, it may be advisable to delay interruption of the pregnancy when it become indicated, in order to try to obtain a viable infant from an elderly primigravida; in most cases the toxemias are not severe and the prognosis good. There is, however, a strong tendency for toxemia to recur in subsequent pregnancies (4).

Unfortunately, the prospect for the patient with chronic nephritis is not at all comparable to that of the hypertensive patient. Many excellent obstetricians feel that chronic nephritis is an absolute contraindication to pregnancy, and that interruption of the pregnancy and sterilization should be performed as soon as the diagnosis is made. A conservative viewpoint is, that probably some patients will be able to survive a pregnancy and have a live, normal infant. The difficulty lies in selecting the patient who should be allowed to go through pregnancy.

Characteristically, the disease become manifest early in pregnancy. There is edema, waxy skin, pallor, weakness and lassitude, and, frequently, visual disturbances. The blood pressure becomes elevated and albuminuria is marked. Anemia is almost always present and does not respond to treatment. Toxemia develops in a large percentage of cases, and while superimposed true eclampsia is probably not common, uremia with convulsions or coma is. Accidents in labor are common such as abruptio placenta, uterine inertia, and postpartum hemorrhage. Life expectancy is definitely decreased by pregnancy and when toxemia is added the prognosis is very poor. Fully two-thirds of all infants of nephritic mothers die; however, premature infants of nephritic mothers appear to do better than infants of the same size from normal mothers (6).

When a patient with chronic renal disease is allowed to go through pregnancy, she must be most carefully observed. At the first sign

of toxemia hospitalization is imperative; and if no improvement occurs the pregnancy should be interrupted. The toxemia occurring in nephritics is severe, progresses rapidly, and is often fatal. The patient and her family should be advised of the situation and should accept responsibility for any delay. Treatment consists of rest, sedation, and a salt-free diet containing limited amounts of protein. Salt-free human albumin can be used to replace the albumin lost in the urine. These measures are usually not very effective.

When discussing the toxemias of pregnancy, it has become customary to omit the etiology or at most, to dismiss this topic with the statement that it has not been determined. However, the subject should occasionally be reopened and new data and opinions considered. During the years since toxemias of pregnancy were first recognized, nearly every conceivable factor has been suggested as the etiologic agent, and uniformly each has been shown not to be the answer. There is nothing to gain here from a discussion of all the theories, but it has been fairly well accepted that the primary factor in pathogenesis is spasm of the arterioles. Two things were principally responsible for this opinion; first, all the anatomic lesions in fatal eclampsia could be explained on this basis, and second, it was well known that effective treatment of toxemia must include vasodilator drugs, and treatment in accord with this concept of arteriolar spasm has been a factor in the lowered mortality rate. Attempts to find the cause of the arteriolar constriction have been uniformly unsuccessful.

Another approach to the problem has recently been proposed by Ernest Page (7). He pointed out that the one single common denominator to all cases of toxemia is uterine ischemia, which in turn produces placental hypoxia; that is, the amount of oxygen available in the placenta is less than that required for normal metabolism. This results in breakdown of trophoblastic tissue and liberation of one or more toxins into the maternal blood stream. Associated with this is a disturbance in metabolism of the trophoblast; variations in steroid and chorionic gonadotrophic hormones have been observed. The Smiths (8) believe that this metabolic change is most significant and that it increased the uterine ischemia, thus producing a vicious cycle. One of the principle substances released from the damaged placenta seems to be thromboplastin (7). The cause of the elevation in blood pressure remains unexplained but it is probably secondary. It is convenient to consider this as an attempt on the part of the maternal organism to increase the blood flow through the ischemic uterus, but this teleological viewpoint is hardly scientific. From these findings, however, we can derive the following: Hypertensive disease and nephritis are predisposing factors to toxemia insofar as

they decrease blood supply to the placenta through anatomic or functional changes in the vessels of the uterus.

We should conclude, therefore, that to separate the "true" from the "pseudo" toxemias is artificial from an etiologic standpoint. Also, the term "toxemia" actually does designate a specific disease entity since placental hypoxia resulting from uterine ischemia is common to all cases, and once initiated, all toxemias are the same. The difference in clinical course of the disease and prognosis are due to variations in structure and function of the maternal organism upon which the processes of the toxemia itself are superimposed. Thus, a normal patient who recovers from a toxemia of pregnancy will again be normal. When actual or latent hypertension precedes the toxemia, we can expect that the effects of the toxemia will tend to be more severe and that there will be an acceleration of the progressive changes of arterial hypertension during the period of active toxemia. Demonstrable residual effects will depend upon the rate and duration of the process. The same is true of nephritis. The severity of the disease and the more pronounced residual changes are due to pre-existing pathologic changes and to the reduction of the already low renal reserve.

It is probable that the toxemia itself does produce some irreversible changes in the maternal organism, but usually these are of no significance.

The etiologic factor of hypoxia is the most reasonable concept available at present. Other conclusions which have been drawn are intended only as a means of putting a maze of complicated observations on a logical basis for further consideration. It is hoped that we soon will be able to put aside speculation and conjecture and speak of the problems of toxemia from a factual standpoint.

SUMMARY

1. Placental hypoxia is suggested as the etiologic factor which initiates all toxemias of pregnancy regardless of the presence or absence of preexisting disease.

2. The variation in symptoms of true, of hypertensive, and of nephritic toxemias of pregnancy are briefly discussed on the premise that the underlying toxemia is essentially identical in all.

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Cardiac Abnormalities Among Recruit Candidates

RALPH I. COTTLE, JR., *Lieutenant, junior grade (MC) U. S. N. R.*

DURING the year 1948, 3,117 men were given pre-enlistment physical examinations at the Des Moines, Iowa, Navy and Marine Corps Recruiting Stations. The purpose of this article is to discuss briefly the cardiac abnormalities which were detected during the examinations.

The men ranged in age from 17 to 31 years. The majority were from rural communities and, for the most part, appeared well developed and well nourished. Prior to their appearance before the examining medical officer, they all underwent necessarily brief and cursory screening examinations before the recruiters, all of whom are nonmedical personnel, at the various substations. Here the most obvious defects were uncovered, and these rejectees are not included in this report. Of the total number of applicants, 86.5 percent were for first enlistment for active duty, 12.1 percent were for re-enlistment after prior service, and 1.4 percent were for first enlistment for inactive reserve duty.

Of the 3,117 men examined, 406, or 13.02 percent, were rejected for medical reasons. Of these rejectees, 37, or 9.11 percent were rejected because of cardiovascular abnormalities. These various abnormalities are listed in table 1.

TABLE 1.—*Cardiovascular abnormalities*

Rheumatic heart disease:	
Mitral stenosis and/or regurgitation.....	18
Aortic regurgitation, "pure".....	1
Aortic regurgitation plus mitral disease.....	3
Arterial hypertension.....	8
Bigeminal rhythm.....	3
Trigeminal rhythm.....	1
Paroxysmal tachycardia.....	1
Recent history of rheumatic fever.....	2
Total	37

At this station, cardiovascular disease as a cause of rejection was exceeded only by flat feet and errors of refraction. In the majority of cases discovered, the presence of the condition was entirely unsuspected by the candidate, and his rejection for service was the first indication that he had of a cardiovascular defect. In several instances, the candidate had recently been examined, and the defect had either not been observed, or its presence had not been made known to the candidate.

Twenty-two cases of rheumatic heart disease were found. Of this total, 18 had apparently pure mitral damage, 3 had both aortic and mitral involvement, and 1 showed aortic damage alone. In all but 2 of these cases, cardiac enlargement was present, the apex of the heart being palpated and percussed at the nipple-line or beyond. None of the men volunteered complaints referable to the heart, but on closer questioning, 3 admitted recent or progressive shortness of breath. These 3 cases, as might be expected, presented the most marked cardiac enlargement; each had mitral stenosis. Of the cases of mitral disease, 9 exhibited stenosis and regurgitation, and 9, regurgitation alone. The 4 cases of aortic disease, all regurgitation, presented only minimally enlarged hearts, and each man was otherwise healthy, active, and muscular; further evidence that slight aortic insufficiency, of rheumatic origin, may be well tolerated and compatible with excellent health. A history of rheumatic fever, chorea, or of suggestive symptoms, was elicited in 12 cases, 54.5 percent, somewhat lower than White's (1) observations of a history of rheumatic fever or chorea in 70 percent of his cases.

Diagnosis of the valvular lesions was made in each instance by auscultation of the classical murmur aided, in the cases of aortic disease, by the presence of an elevated pulse pressure and palpation of Corrigan's pulse, which was present in each of the cases of aortic regurgitation.

Hypertension was found in 8 men. The initial blood pressure reading was found to be elevated in a considerable percentage of all the recruit candidates, but in most instances only the systolic reading was above normal, and returned to lower levels within a short time. In the 8 cases of persistent hypertension, the diastolic readings ranged from 96 to 104 mm. of mercury and persisted despite a period of rest.

Four very interesting findings were 3 cases of bigeminal rhythm, and 1 case of trigeminal rhythm. Each of the subjects was otherwise entirely free of physical evidence of heart disease or of a history suggestive of it. This fact raised a rather perplexing problem in view of the fact that, although the presence of the arrhythmia did not necessarily indicate the presence of heart disease, the candidates had

to be rejected for service on the basis of a "marked arrhythmia" (2). It proved quite difficult to reconcile these two seemingly contradictory statements to the rejected candidates. In each of the 4 cases, the arrhythmia disappeared after moderate exercise, but promptly returned upon slowing of the heart rate. Electrocardiographic evidence of the precise origin of the arrhythmia was not available.

One man gave a history of frequent attacks of palpitation, making him giddy and weak. The attacks all terminated as spontaneously as they began; on one occasion doing so while climbing the stairs to his physician's office to seek relief from the attack. Upon examination, this man presented numerous extrasystoles, making a diagnosis of paroxysmal tachycardia seem most probable. Again, electrocardiographic evidence was not to be had, but the classical description which he volunteered, together with the frequent extrasystoles found, left little doubt as to the diagnosis.

Two men gave a history of acute rheumatic fever within the past 5 years, which automatically disqualified them for enlistment (3), even though these two men presented no evidence of heart disease.

Purely benign cardiovascular "abnormalities," particularly functional or physiologic murmurs, and occasional extrasystoles, were encountered very frequently. These caused difficulty only insofar as the functional murmurs had to be carefully differentiated from the pathologic ones. In the large majority of cases this could easily be done as described by Harris (4). Of all the recruit candidates examined, between 20 and 30 percent showed functional murmurs at some time during the examination. The waning of intensity of the murmur during deep inspiration, or, more frequently, its complete disappearance, was the most easily elicited and the most constant sign of the benignity of the murmur. The murmurs themselves were all systolic in time, of faint to moderate intensity, found most frequently in the pulmonic area, were not significantly transmitted, and, as mentioned, waxed and waned with the respiratory cycle.

Infrequent extrasystoles were found on occasion and, in all instances, caused no symptoms or complaints.

SUMMARY

1. Cardiovascular disease is an important cause of rejection of recruit candidates, being exceeded in frequency only by flat feet and errors of refraction.

2. Rheumatic heart disease accounted for most of the cardiovascular rejectees, being followed in frequency by hypertension and arrhythmias.

3. The frequency of functional murmurs was discussed, and the importance of differentiating them from pathologic murmurs, and simple criteria for doing so, were briefly mentioned.

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Measles Epidemic on Guam¹

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AN EXTENSIVE epidemic of measles, Rubeola, occurred on Guam, M. I., from mid-June through mid-August 1948. This epidemic was almost entirely confined to the young native Guamanian population, among whom 5,022 cases were reported. Only 41 cases occurred among the nonnative population, 17 of whom were military personnel and 24 were military dependents. Twenty percent of the Guamanian population was affected.

Old records show that measles has been introduced on Guam at irregular intervals since 1861 when a severe outbreak developed after the visit of a trading schooner. Since that time important measles epidemics have occurred in 1888, 1913, 1924, 1927, and 1932. The 1932 epidemic had a total of 2,054 cases reported with 152 deaths, a mortality rate of 7.4 percent or 74 per 1,000 cases.

EPIDEMIOLOGY

As of 30 September 1948, the native population of Guam was 25,917. Of this number, 12,451 were below the age of 16, with 13,466 being in the older age group. Since the last measles epidemic on Guam occurred in 1932, more than one-half of the population were susceptible to the disease at the onset of the 1948 epidemic. Of the 5,022 Guamanian cases, 90 percent were in the age group of 16 or younger; 32 percent were under the age of 5 years. Less than 1 percent occurred in the age group past 25 years. The youngest case reported was in an 11-day-old infant who was born to a mother having measles at the time of delivery. The oldest case encountered was 41 years old. The morbidity rate in the age group below 16 years was 35 percent, while in the older group it was 5 percent.

The native population of Guam is largely concentrated in 18 rather compact villages scattered over its 225 square mile area. The dwellings are small as a rule and usually inadequate for the small families.

¹ From the Department of Public Health, Naval Government of Guam, M. I.

With the improved roads and the modern transportation, intravillage travel is extensive, and visiting between families and friends is traditionally frequent. This situation predisposed to wide dissemination of the disease early in the epidemic (table 1).

TABLE 1.—*Village incidence of measles*

Town	Popula- tion	Total cases	Deaths	Incidence ratio
				<i>Percent</i>
Agat.....	1,548	425	1	27.4
Santa Rita.....	1,200	450	1	37.5
Piti.....	1,283	132	0	10.3
Asan.....	1,142	241	0	21.1
Agana.....	506	109	0	21.5
Barrigada.....	3,810	630	3	16.5
Tamuning.....	1,029	105	1	10.2
Mongmong and Toto.....	1,651	215	2	13.0
Yigo.....	680	116	0	17.0
Dededo.....	1,212	109	0	9.0
Agana Heights.....	1,556	164	0	10.5
Sinajana.....	4,642	526	2	11.3
Chalan Pago.....				
Ordot.....	1,168	545	1	46.6
Yona.....				
Talofofa.....	821	342	0	41.5
Inarajan.....	1,425	518	1	36.3
Merizo.....	952	163	1	17.1
Umatie.....	533	232	0	43.5
Total.....	25,161	5,022	13	19.9

The first reported case in this epidemic was in the village of Agat, and was reported to the Public Health Department in the last week of March 1948. Where this patient acquired measles is not definitely known, but it is believed that the disease was introduced by an undetected transport passenger. During the following 10 weeks, sporadic cases of measles were reported in numerous Guamanian villages. The incidence began to increase in June and was considered to have reached epidemic proportions by mid-July.

CONTROL MEASURES

As the incidence of measles began to reach epidemic proportions, the Department of Public Health organized all its available personnel into 4 control teams. Each team was headed by a medical officer and was assigned to a designated group of villages. In addition to the 4 Navy medical officers, 1 Navy nurse, 4 Chief Hospitalmen, 16 Guamanian clinic nurses of the Public Health Department, 2 Army nurses, and 1 Red Cross nurse were temporarily assigned to the Public Health Department to assist in the control work.

The following control program was outlined for these teams:

(a) Visit each new case promptly after it is reported. Record data as to the age and name of the patient, temperature, the date of exposure, and the onset of the rash. Examine all contacts in the family. Instruct the responsible

members of the family regarding proper care of the patient and quarantine measures to be followed.

(b) Administer human immune serum globulin in modifying dosage to all contacts below the age of 5 years, to older contacts in poor physical condition due to anemia, malnutrition, or chronic disease, and to all pregnant female contacts who give no history of measles.

(c) Place quarantine placards on the house.

(d) Make daily follow-up visits to all cases, keeping accurate temperature and progress records.

(e) Render treatment or disposition as indicated.

To encourage reporting of new cases, an extensive educational program concerning measles was put into effect by means of the local newspaper and mimeographed pamphlets, in both English and Chamorro. The police station in each village was the local reporting center where the names and addresses of the new cases were reported. Case reporting was poor early in the epidemic, but soon it was greatly improved.

The human immune serum globulin was administered intramuscularly in a dose of 0.02 cc. per pound body weight, this being the accepted dose for modifying the disease (1). It was our desire to confer immunity by a modified attack rather than confer temporary full immunity by an immunizing dosage of the globulin, although the latter method was followed in a few cases where it was apparent that the physical condition of the contact would make an attack of measles especially dangerous.

TREATMENT

Active treatment of the cases was symptomatic, prophylactic, and specific. Symptomatic therapy consisted of cough mixtures and antipyretics as indicated. Prophylactic therapy consisted of intramuscular administration of penicillin (300,000 units per cc.) in oil and wax to all cases having an unusual febrile reaction during convalescence, or to abort any incipient complications. Specific therapy consisted mainly of intramuscular penicillin in oil and wax at the onset of complications such as bronchopneumonia or otitis media. In a few cases under the latter circumstances sulfadiazine tablets were given orally.

COMPLICATIONS

The bulk of the detailed control work was performed by the nurses and Chief Hospitalmen who notified the medical officer of the control team whenever a patient had an unusual febrile reaction or appeared unduly ill. The medical officer examined all such cases, prescribed treatment, and made the decision as to whether or not the case should be treated at home or should be transferred to the hospital. Approximately 100 patients required transfer to the Guam Memorial Hospital.

The average unmodified (by immune globulin) case of measles in the epidemic on Guam seemed to fit the textbook picture closely. No significant change was noted in the incubation period, the prodromal period, or during the eruption. However, complications appeared more frequently and were more severe than usually seen (2).

Complications occurred at varying intervals following the eruption. They were encountered from 1 day to 3 weeks after appearance of the rash but most frequently had their onset between 3 and 6 days after the rash appeared.

Among the less severe complications were mild, or moderately extensive bronchopneumonia, bronchitis, otitis media, skin infections, conjunctivitis, and gastro-enteritis. The majority of these responded well to antibiotic and symptomatic therapy in the home. Incidentally, of the 41 patients among the nonnative population, none had any serious complications.

It is believed that many complications were aborted because penicillin in oil and wax was administered intramuscularly promptly with the first appearance of any unusual febrile reaction. Slightly more than 500 patients were so treated. The single daily dose of penicillin given ranged from 150,000 units to 300,000 units, depending upon the nature and severity of the complication and the age of the patient.

Acute encephalitis was diagnosed in 12 cases. Eleven of these were hospitalized and 1 died at home. Of the 11 cases hospitalized, 5 died and the remaining 6 have completely recovered.

Approximately 100 patients were hospitalized in the Guam Memorial Hospital with severe complications of measles. Among these, respiratory tract infections were most common. Twenty patients had bronchopneumonia, as shown by roentgenogram, and 11 patients had acute encephalitis. Among the other conditions requiring hospitalization were: gastro-enteritis with marked dehydration, 5 cases; severe convulsions, 3 cases; severe otitis media, 3 cases; lobar pneumonia, 1 case; and meningococcic meningitis, 1 case. The remainder of those hospitalized had either a severe bronchitis or appeared to have a serious toxemia.

DEATHS

There were 13 deaths attributable to measles or its complications during this epidemic. The cause of death in these was:

Bronchopneumonia	7	Lateral sinus thrombosis.....	1
Encephalitis	4	Unknown	1

Two deaths from bronchopneumonia and one death from acute encephalitis (diagnosed at autopsy) occurred in the home,

Of the 10 cases that died in the hospital, 3 had received immune globulin prior to the onset of the measles rash. Each of these apparently had very mild measles but later developed a complication which caused death, 2 dying of acute encephalitis and bronchopneumonia, while the cause of death in the third remains obscure even after autopsy. Of the 11 hospitalized with an acute encephalitis complication, 3 died of encephalitis, 1 died of accompanying pneumonia, and 1 died of lateral sinus thrombosis resulting from mastoiditis. The remaining 6 have completely recovered. The mortality rate for the 5,022 native Guamanian cases was 0.26 percent or 2.6 deaths per 1,000 reported cases. As it is believed that a number of measles cases in the outlying ranch country were not reported to the Public Health Department early in the epidemic, the actual mortality rate was something less than this figure. There were no deaths among the 41 cases in the nonnative population.

HUMAN IMMUNE SERUM GLOBULIN

A total of 1,266 immune globulin modification doses were given to contacts as noted previously. Approximately 70 percent of these were known to have been given within 5 days of exposure, the remainder were given as soon as the exposure was discovered but the exact date of the initial exposure could not be determined. No toxic symptoms or untoward reactions from the immune globulin were noted. Of the 1,266 contacts given modifying globulin injections, 712 or 57 percent subsequently developed a clinical entity recognizable as measles. In 82 percent of these there was a definite modification of the disease as judged by the relative mildness of symptoms, the febrile course, and the extent of the rash. In most of these patients, there was an almost complete absence of coryzal symptoms, a minimal eruption, and a low grade febrile course of one or two days' duration. In this group complications were rare and generally mild. In the remaining 18 percent of the cases occurring after modifying globulin was given the course and duration approximated the average case not receiving modifying globulin.

As noted previously, 3 deaths occurred in patients who had received immune globulin previous to the onset of the measles rash. Each of these apparently had a mild, modified case of measles but later developed a complication which caused death.

MEASLES IN PREGNANCY

Immune globulin in a modifying dose (0.02 cc. per pound body weight) was given to 41 pregnant contacts who had no history of measles. Measles subsequently occurred in only 2 of these contacts.

One of these developed the rash 1 day following the injection. The case was mild with no complications to the mother or fetus. In the second case, modifying globulin was given 10 days after exposure and the rash developed 1 day later. This patient had very severe measles. However, the pregnancy continued to term uncomplicated.

Measles was observed in 30 gravid females. Five were in the first trimester of pregnancy, 13 in the second, and 12 in the third. The disease in this group varied from mild to severe. Two complications of pregnancy were observed in this group: One 18-year-old para I had severe measles and, 3 days subsequent to the disappearance of the rash, delivered a 6½-months premature infant who died 2 days later in the hospital; the second patient delivered a full-term stillborn fetus on the day the rash appeared with no evidence of a rash on the infant.

In the remainder of the series of measles in gravid females, no complications were noted and all had uneventful deliveries of apparently normal infants at term. It is interesting to note that 7 in this group delivered full-term infants simultaneously with or within 2 days of the appearance of the measles rash and in no case was measles evident in the child, although 1 child (breast fed) developed measles at the age of 11 days.

CONCLUSIONS

Human immune serum globulin is of definite value in producing a modified type of measles when given in a dose of 0.02 cc. per pound body weight. From our results this seems to be closer to the maximum rather than the minimum dose and with a smaller dose, perhaps a higher incidence of modified measles would occur. The combination of modifying globulin immunization, and early antibiotic therapy of complications on an out-patient basis was effective in keeping the mortality low.

SUMMARY

An extensive outbreak of measles occurred on Guam in which 5,022 cases were reported. Thirteen deaths resulted directly from the complications of measles. The mortality rate was 0.26 percent. A large majority of the cases were reported to the Public Health Department whose workers recorded daily temperatures, gave modifying human immune serum globulin immunizations, and active therapy or hospitalized the patient as necessary. One thousand, two hundred and twenty-six modifying immunizations with human immune globulin were given. Seven hundred and twelve or 57 percent of these contracted measles which, in 82 percent, was a modified, mild type. Complications were frequent. Respiratory tract infections and otitis media were common while bronchopneumonia was the most common

cause for hospitalization. A diagnosis of acute encephalitis was made in 12 patients. Four died of encephalitis; 2 of other causes. Bronchopneumonia was the most common cause of death; 7 deaths were caused by this complication. One death resulted from a lateral sinus thrombosis and in 1 the cause of death is unknown.

Measles occurred in 30 gravid females. One premature delivery (6½ months) and 1 stillbirth occurred in this group. The remainder suffered no ill effects.

Penicillin in beeswax and peanut oil was used effectively on an out-patient basis for treatment of the measles complications, or to abort such complications.

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Venereal Disease Contact Investigation, Navy and Marine Corps, April-June 1948

WILLIAM J. DOUGHERTY, *Commander (MC) U. S. N.*

INCREASING emphasis has been placed upon contact investigation as a means of discovering individuals infected with a venereal disease and bringing them to early treatment, thereby reducing the reservoir of infection in the community. The Eight-Point Agreement¹ defines the responsibility of the military to report the civilian contacts of infected military personnel.

The Navy initiated a standardized venereal disease contact reporting system in July 1944. Early analysis of the efficiency of this system indicated that 21 percent of the contacts were located. At that time, 60 percent of the reports were considered inadequate by Navy standards.

In the second quarter of 1948, 4,300 contact reports indicating exposure to venereal infection in cities and towns of the United States were prepared by naval shore activities and ships. To allow sufficient time for the completion of investigation and reporting to the Bureau of Medicine and Surgery, analysis of these reports was delayed for 90 days subsequent to the end of the second quarter.

Present results do not differ from those first reported. Twenty-four percent of reports resulted in location of contacts and 66 percent of the reports are judged inadequate by Navy standards.

Failure of location ("insufficient data," "contact not located"), in 45 percent of the reports may be assigned to the inadequacy of information contained in the report (table 1). However, the category "no report returned" represents a variable of approximately one-third of reports which cannot be assessed.

¹ The new Eight-Point Agreement of 1946: An agreement by the Army, Navy, Treasury Dept., and Assn. of State and Territorial Health Officers on measures for the control of venereal disease, signed in April 1946.

TABLE 1.—*Distribution of Navy venereal disease contact reports*^{1 2}

[Results of investigation, April-June 1948]

Reporting naval district	Number of reports	Results of civilian Public Health investigation							
		Total	No report returned	Insufficient data	Contact not located	Contact located			
						Under treatment	Brought to treatment	Not infected	Uncooperative; no examination
		Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Total	4,323	100.0	31.0	21.0	24.0	3.0	12.0	8.0	0.5
Ships	1,924	100.0	24.0	24.0	27.0	3.0	13.0	8.0	0.3
Districts	2,399	100.0	36.0	18.0	22.0	3.0	12.0	8.0	0.6
Potomac River	201	100.0	21.0	50.0	11.0	3.0	8.0	5.0	2.0
Severn River	47	100.0	2.0	60.0	17.0	4.0	8.0	8.0	0.0
First	237	100.0	94.0	2.0	2.0	0.0	2.0	0.0	0.0
Third	204	100.0	22.0	38.0	29.0	2.0	6.0	2.0	0.0
Fourth	112	100.0	51.0	6.0	26.0	0.0	11.0	4.0	2.0
Fifth	863	100.0	23.0	32.0	23.0	2.0	12.0	6.0	0.1
Sixth	140	100.0	24.0	4.0	29.0	9.0	19.0	14.0	0.0
Seventh	187	100.0	12.0	17.0	36.0	1.0	16.0	14.0	2.0
Eighth	398	100.0	61.0	12.0	14.0	1.0	8.0	3.0	0.5
Ninth	122	100.0	62.0	4.0	15.0	0.0	10.0	6.0	2.0
Tenth	8	100.0	38.0	13.0	50.0	0.0	0.0	0.0	0.0
Eleventh	797	100.0	16.0	15.0	35.0	5.0	16.0	11.0	0.4
Twelfth	398	100.0	29.0	16.0	22.0	5.0	18.0	10.0	0.0
Thirteenth	121	100.0	19.0	22.0	24.0	4.0	19.0	12.0	0.0
Fourteenth	13	100.0	69.0	15.0	15.0	0.0	0.0	0.0	0.0
Fifteenth	9	100.0	78.0	22.0	0.0	0.0	0.0	0.0	0.0
Seventeenth	5	100.0	0.0	0.0	20.0	20.0	40.0	20.0	0.0
No district	461	100.0	26.0	26.0	26.0	2.0	10.0	8.0	0.0

¹ Only contact reports specifying exposure in cities and towns of the United States.² Prepared from Navmed 171, second quarter, 1948, by the Medical Statistics Division, Bureau of Medicine and Surgery.

The inadequate characteristics of the reports are distributed equally between ships and naval districts (table 2). As reasonably expected, the better the quality of information, the higher the proportion of location of contacts. It is observed that health departments classify only 2 and 4 percent of class A (adequate) and B (good) reports as containing insufficient information for investigation. In contrast, 30 percent of class C (inadequate) reports are so returned. This represents a failure to supply adequate and useful information. Failure to receive a report of action by health departments does not appear to be related to the adequacy of the reports submitted (table 3).

Although some health departments have expressed reluctance to investigate contacts reported by patients with gonorrhea, nevertheless the proportion of investigations resulting in locations and those with unsuccessful results are essentially the same for both gonorrhea and syphilis. This indicates a uniformity of action taken regardless of the disease entity. In considering the two categories, "insufficient data to initiate investigation" and "no report returned" a little difference is observed in class A and B reports (table 4). However, in class C reports, a higher proportion of gonorrhea contact reports

are considered as "insufficient for investigation" than are syphilis reports. A reversal of proportion exists in the category of "no report returned." This may be construed to indicate that a report containing meager data on an alleged syphilis contact is considered diligently and subject to more prolonged investigation than a comparable class C gonorrhea report.

TABLE 2.—*Distribution of Navy venereal disease contact reports by evaluation of report data*^{1 2}

[April-June 1948]

Ships and districts	Evaluation of reports							
	Number				Percent			
	Total	A	B	C	Total	A	B	C
All reports.....	4,323	379	1,084	2,860	100.0	9.0	25.0	66.0
Ships.....	1,924	141	474	1,309	100.0	7.0	25.0	68.0
Districts.....	2,399	238	610	1,551	100.0	10.0	25.0	65.0
Potomac River.....	201	17	65	119	100.0	9.0	32.0	59.0
Severn River.....	47	1	14	32	100.0	2.0	30.0	68.0
First.....	237	15	64	158	100.0	6.0	27.0	67.0
Third.....	204	7	44	153	100.0	3.0	22.0	75.0
Fourth.....	112	3	36	73	100.0	3.0	32.0	65.0
Fifth.....	863	75	224	564	100.0	9.0	26.0	65.0
Sixth.....	140	15	37	88	100.0	11.0	26.0	63.0
Seventh.....	187	18	46	123	100.0	10.0	24.0	66.0
Eighth.....	398	17	130	251	100.0	4.0	33.0	63.0
Ninth.....	122	18	34	70	100.0	14.0	28.0	58.0
Tenth.....	8	0	1	7	100.0	0.0	12.0	88.0
Eleventh.....	797	88	174	535	100.0	11.0	22.0	67.0
Twelfth.....	398	42	87	269	100.0	10.0	22.0	68.0
Thirteenth.....	121	20	25	76	100.0	16.0	21.0	63.0
Fourteenth.....	13	0	3	10	100.0	0.0	23.0	77.0
Fifteenth.....	9	1	3	5	100.0	11.0	33.0	56.0
Seventeenth.....	5	2	2	1	100.0	40.0	40.0	20.0
No districts.....	461	40	95	326	100.0	8.0	21.0	71.0

¹ A—Adequate information. B—Good information. C—Inadequate information.

² Prepared from Navmed 171, second quarter, 1948, by the Medical Statistics Division, Bureau of Medicine and Surgery.

TABLE 3.—*Distribution of Navy venereal disease contact reports by evaluation of report data*¹

[Results of investigation, April-June 1948]

Evaluation of report data	Number of reports	Percent				
		Total	No report return	Insufficient data	Contact not located	Contact located
All reports.....	4,323	100.0	31.0	21.0	24.0	24.0
Ships.....	1,924	100.0	24.0	24.0	27.0	25.0
Districts.....	2,399	100.0	36.0	18.0	22.0	24.0
"A".....	379	100.0	27.0	2.0	16.0	55.0
"B".....	1,084	100.0	38.0	4.0	22.0	36.0
"C".....	2,860	100.0	29.0	30.0	26.0	15.0

¹ Prepared from Navmed 171, second quarter, 1948, by the Medical Statistics Division, Bureau of Medicine and Surgery.

TABLE 4.—*Distribution of Navy venereal disease contact reports by evaluation of data, results of investigation, and disease*¹

[April-June 1948]

Evaluation of report data	Number of reports	Percent				
		Total	No report return	Insufficient data	Contact not located	Contact located
All reports.....	4,213	100.0	31.0	21.0	24.0	24.0
Gonorrhea.....	3,729	100.0	30.0	22.0	24.0	23.0
Syphilis.....	484	100.0	38.0	14.0	23.0	26.0
"A":						
Gonorrhea.....	310	100.0	27.0	2.0	17.0	54.0
Syphilis.....	65	100.0	24.0	4.0	9.0	62.0
"B":						
Gonorrhea.....	920	100.0	37.0	4.0	23.0	35.0
Syphilis.....	137	100.0	40.0	2.0	21.0	37.0
"C":						
Gonorrhea.....	2,499	100.0	28.0	31.0	25.0	15.0
Syphilis.....	282	100.0	39.0	22.0	27.0	12.0

¹ Prepared from Navmed 171, second quarter, 1948, by the Medical Statistics Division, Bureau of Medicine and Surgery.TABLE 5.—*Distribution of Navy venereal disease contact reports by State specified as place of exposure*¹

[April-June 1948]

State	Exposures		State	Exposures	
	Number	Percent		Number	Percent
All States.....	4,323	100.0	Indiana.....	21	0.5
California.....	1,223	28.0	Arkansas.....	15	
Virginia.....	719	16.0	Missouri.....	15	
New York.....	348	8.0	Oklahoma.....	14	
Florida.....	322	7.0	Oregon.....	9	
District of Columbia.....	164	4.0	Arizona.....	8	
North Carolina.....	159	4.0	Maine.....	8	
Massachusetts.....	147	4.0	Connecticut.....	7	
Pennsylvania.....	121	2.0	Michigan.....	7	
Louisiana.....	119	2.0	Mississippi.....	7	
South Carolina.....	111	2.0	New Mexico.....	7	3.7
Washington.....	110	2.0	Colorado.....	6	
Tennessee.....	103	2.0	Kansas.....	6	
Texas.....	100	2.0	Wisconsin.....	6	
Illinois.....	70	2.0	Minnesota.....	5	
Maryland.....	67	2.0	Iowa.....	4	
New Jersey.....	54	1.0	Utah.....	4	
Georgia.....	50	1.0	Delaware.....	3	
Rhode Island.....	41	1.0	Nebraska.....	2	
Alabama.....	31	.7	Montana.....	1	
Ohio.....	31	.7	Nevada.....	1	
New Hampshire.....	27	.6	South Dakota.....	1	
Kentucky.....	24	.6	Vermont.....	1	
West Virginia.....	23	.5	Wyoming.....	1	

¹ Prepared from Navmed 171, second quarter, 1948, by the Medical Statistics Division, Bureau of Medicine and Surgery.

The distribution of Navy Venereal Disease Contract Reports is approximately proportional to the concentration of personnel in any area. Table 5 indicates the principal States to which contact reports are submitted. It is observed that approximately 60 percent of reports specify exposure in the States of California, Virginia, New York,

and Florida. Table 6 indicates cities of importance. This distribution of 31 cities specified 20 or more times in a quarter, accounts for 75 percent of reports specifying exposure within the United States. In this distribution the cities of Norfolk, Va., San Diego and San Francisco, Calif., New York, N. Y., and Los Angeles, Calif., alone constituted approximately 38 percent of all reports submitted.

TABLE 6.—*Distribution of Navy venereal disease contact reports by selected States and cities*¹

[Results of investigation, all venereal diseases, April-June 1948]

State and city	Number of reports	Results of civilian Public Health investigation				
		Total	No report return	Insufficient data	Contact not located	Contact located
		Percent	Percent	Percent	Percent	Percent
All reports.....	4,323	100.0	31.0	21.0	24.0	24.0
District of Columbia: Wash- ington.....	164	100.0	16.0	63.0	10.0	10.0
California.....	1,223	100.0	17.0	16.0	32.0	34.0
San Diego.....	326	100.0	7.0	15.0	34.0	43.0
San Francisco.....	299	100.0	36.0	17.0	17.0	29.0
Los Angeles/San Pedro.....	202	100.0	15.0	20.0	40.0	25.0
Miscellaneous.....	166	100.0	14.0	14.0	37.0	36.0
Oakland.....	116	100.0	16.0	17.0	32.0	34.0
Long Beach.....	91	100.0	2.0	14.0	47.0	36.0
Vallejo.....	23	100.0	0.0	4.0	34.0	61.0
Florida.....	322	100.0	38.0	8.0	24.0	28.0
Jacksonville.....	118	100.0	4.0	6.0	39.0	51.0
Pensacola.....	96	100.0	94.0	0.0	3.0	2.0
Key West.....	44	100.0	14.0	14.0	43.0	30.0
Miscellaneous.....	33	100.0	42.0	6.0	12.0	39.0
Miami.....	31	100.0	26.0	38.0	26.0	10.0
Illinois.....	70	100.0	63.0	4.0	20.0	12.0
Chicago.....	45	100.0	60.0	2.0	29.0	9.0
Miscellaneous.....	25	100.0	68.0	8.0	4.0	20.0
Louisiana.....	119	100.0	32.0	23.0	32.0	12.0
New Orleans.....	108	100.0	32.0	23.0	32.0	12.0
Miscellaneous.....	11	100.0	36.0	18.0	27.0	18.0
Maryland.....	67	100.0	10.0	18.0	40.0	31.0
Miscellaneous.....	40	100.0	18.0	28.0	15.0	40.0
Baltimore.....	27	100.0	0.0	4.0	78.0	18.0
Massachusetts.....	147	100.0	93.0	0.7	2.0	4.0
Boston.....	116	100.0	93.0	0.0	2.0	4.0
Miscellaneous.....	31	100.0	90.0	3.0	0.0	6.0
New Jersey.....	54	100.0	37.0	26.0	11.0	26.0
Miscellaneous.....	33	100.0	36.0	24.0	9.0	30.0
Atlantic City.....	21	100.0	38.0	28.0	14.0	19.0
New York.....	348	100.0	21.0	41.0	27.0	10.0
New York City.....	289	100.0	20.0	45.0	27.0	8.0
Brooklyn.....	30	100.0	20.0	30.0	33.0	16.0
Miscellaneous.....	29	100.0	34.0	17.0	24.0	24.0
North Carolina.....	159	100.0	86.0	2.0	6.0	6.0
Miscellaneous.....	107	100.0	82.0	2.0	8.0	8.0
Kingston.....	27	100.0	88.0	0.0	11.0	0.0
Wilmington.....	25	100.0	96.0	4.0	0.0	0.0
Pennsylvania.....	121	100.0	50.0	6.0	24.0	19.0
Philadelphia.....	96	100.0	54.0	5.0	22.0	19.0
Miscellaneous.....	25	100.0	36.0	8.0	36.0	20.0
Rhode Island.....	41	100.0	100.0	0.0	0.0	0.0
Miscellaneous.....	21	100.0	100.0	0.0	0.0	0.0
Newport.....	20	100.0	100.0	0.0	0.0	0.0
South Carolina.....	111	100.0	14.0	3.0	35.0	48.0
Charleston.....	84	100.0	12.0	4.0	34.0	50.0
Miscellaneous.....	27	100.0	22.0	0.0	37.0	41.0
Tennessee.....	103	100.0	56.0	14.0	14.0	17.0
Memphis.....	81	100.0	51.0	14.0	16.0	18.0
Miscellaneous.....	22	100.0	77.0	9.0	4.0	9.0
Texas.....	100	100.0	67.0	9.0	9.0	15.0
Miscellaneous.....	73	100.0	60.0	11.0	12.0	16.0
Corpus Christi.....	27	100.0	85.0	4.0	0.0	11.0

TABLE 6.—*Distribution of Navy venereal disease contact reports by selected States and cities*¹—Continued

[Results of investigation, all venereal diseases, April-June 1948]

State and city	Number of reports	Results of civilian Public Health investigation				
		Total	No report return	Insufficient data	Contact not located	Contact located
		Percent	Percent	Percent	Percent	Percent
Virginia.....	719	100.0	7.0	38.0	28.0	25.0
Norfolk.....	538	100.0	6.0	38.0	32.0	24.0
Portsmouth.....	95	100.0	7.0	47.0	10.0	36.0
Miscellaneous.....	61	100.0	20.0	41.0	20.0	29.0
Newport News.....	25	100.0	8.0	32.0	20.0	40.0
Washington.....	110	100.0	16.0	23.0	18.0	44.0
Seattle.....	66	100.0	12.0	20.0	18.0	50.0
Bremerton.....	23	100.0	8.0	44.0	22.0	26.0
Miscellaneous.....	21	100.0	33.0	10.0	14.0	43.0

¹ Prepared from Navmed 171, second quarter, 1948, by the Medical Statistics Division, Bureau of Medicine and Surgery.

Attention is now directed to the results of contact investigation recorded for those cities to which the greater portion of our problem may be assigned. It is well to recall that two-thirds of the reports are considered inadequate and that only 24 percent result in location of contacts. It is observed that a wide variation exists in the activity of the health departments of these cities which cannot be related to the adequacy of the data submitted (see table 6). Considering reports returned with action indicated as "contact not located" and "contact located" as evidence of completed epidemiological investigation, a typical example of this variation exists in the contrast between San Francisco and San Diego. In the former city 46 percent of contact reports are investigated, in the latter, 77 percent. In San Francisco, 29 percent of all reports result in location in contrast to San Diego where 43 percent of all reports result in location.

Inadequate information is a basic limitation of the efficiency of the Navy contact reporting system. To meet this deficiency, the district and station venereal disease control officers have, cooperatively with local Public Health authorities, developed a contact interviewers' training program. To serve as text and as a guide the Interviewer's Aid was developed and published by the Bureau of Medicine and Surgery. The courses have been didactic and short, serving to develop the fundamental ground work for the interviewing technique while under instruction. It is necessary, then, for the man to make the transition from the didactic to the practical following his training period.

Recognizing the necessity for practical training, the United States Public Health Service established a course in contact interviewing and investigation at Gallinger Municipal Hospital, Washington, D. C. This program was initially planned for the training of civilian inter-

viewers. However, the mutual advantage of well-trained interviewers in the Armed Forces was recognized and provision was made for training of some military personnel in each class assembled.

The course of instruction included the fundamentals of venereal diseases and their epidemiology, the audio-visual observation of actual interviews, followed by discussion of the techniques utilized. Each man, in turn, under the observation of his fellow classmates, conducted interviews. Following the interview, the class and instructor held a critique in which the techniques and strong as well as weak points of the interview were discussed with the interviewer. The men are then permitted to accompany a contact investigator of the local health department in tracing contacts that have been reported.

The question arose as to how the benefits of the advanced training could be utilized most efficiently.

TABLE 7.—*Distribution of Navy venereal disease contact reports, continental activities of United States submitting 10 or more reports*¹

[April-June 1948]

Number of reports	Number activities submitting	Number of reports submitted	Percent reports submitted
Total	(2)	2,399	100.0
Under 10	(2)	508	21.0
10-19	26	345	14.0
20-29	10	246	10.0
30-39	11	372	16.0
40 and over	14	933	39.0

¹ Prepared from Navmed 171, second quarter, 1948, by the Medical Statistics Division, Bureau of Medicine and Surgery.

² Undetermined.

Fifty-five percent of the reports submitted by shore activities originated in 25 stations, which submitted 20 or more reports per quarter (table 7). It was, therefore, determined that, insofar as practical, men from these 25 stations would be among the first assigned to advanced training. It was requested that the men assigned by local commands be picked from among those who had completed a basic training course in the naval district, and that they be selected for intelligence, initiative, tact, and understanding. Twenty-eight select men have now successfully completed the training course. The interest and enthusiasm manifest by the men has been remarkable. The problems of contact interviewing and investigation have been understood by many for the first time. The broad and complex aspects of the epidemiology of venereal diseases are opened for exploration upon the realization that for every case of venereal disease there may be more than just one contact to be found. In reality as many as 10 contacts may be associated with an infected individual during the incubation period of his disease. Men also begin to realize that for each con-

tact that is not brought to treatment a new pyramid is developed (fig. 1).

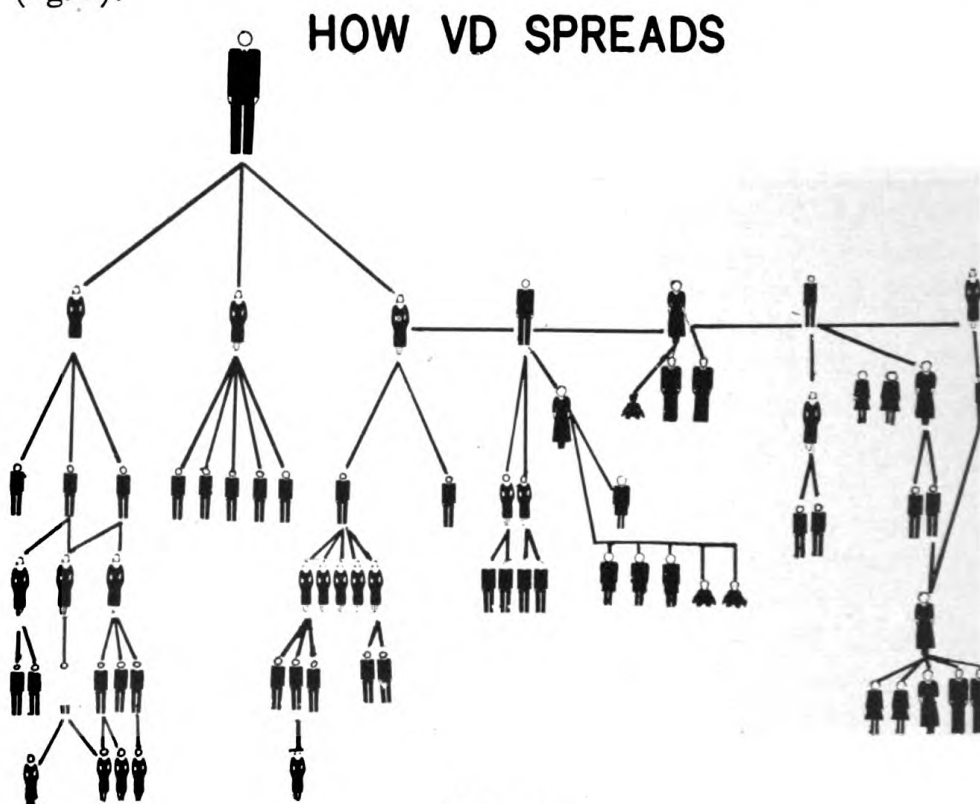


Figure 1.

TABLE 8.—Contact, epidemiological, and treatment indices, venereal disease contact reports¹

[Based on Admissions from Continental Stations, all Venereal Diseases April-June 1948]

Reporting naval district	Number of admissions ²	Number of reports	Contact, index ³	Epidemiological, index ⁴	Treatment index ⁵
Total	2, 296	2, 367	1.0	0.2	0.1
Potomac River.....	228	240	1.0	0.1	0.1
Severn River.....					
First.....	91	118	1.0	0.0	0.0
Third.....	106	120	1.0	0.1	0.1
Fourth.....	79	76	1.0	0.1	0.1
Fifth.....	240	442	2.0	0.2	0.2
Sixth.....	69	78	1.0	0.2	0.2
Seventh.....	190	169	0.9	0.2	0.2
Eighth.....	284	316	1.0	0.1	0.1
Ninth.....	113	116	1.0	0.1	0.1
Eleventh.....	562	360	0.6	0.1	0.1
Twelfth.....	237	258	1.0	0.2	0.2
Thirteenth.....	97	74	0.8	0.2	0.1

¹ Prepared from Navmed 171, second quarter, 1948, by the Medical Statistics Division, Bureau of Medicine and Surgery.

² Original admissions (A's) only—Navmed 582.

³ Number contact reports per admission.

⁴ Number contacts located per admission.

⁵ Number contacts brought to treatment per admission.

The value of this training to the men and to the Navy must not be measured in terms of enthusiasm but, in the final analysis, in terms of results achieved. The first result to be anticipated is an increase in the volume of contact reports.

The ratio, by naval districts, between the number of new admissions and the number of contact reports resulting from contact interviews of newly admitted patients is given in table 8. As readily observed, the ratio at present is approximately one contact report per case.

The effectiveness of the Venereal Disease Interview Training Program will be manifest, therefore, by a gradual rise in the contact indices of the naval districts. Table 9 gives the contact indices for stations submitting 30 or more contact reports per quarter. Since trained interviewers are present on these stations the effectiveness of their efforts will be indicated by a contact index that increases from 1 to 2 or higher.

TABLE 9.—*Contact indices for continental naval stations submitting 30 or more contact reports per quarter*¹

[All Venereal Diseases—April-June 1948]

Reporting station	Number of admissions ²	Number of contact reports received	Contact index
Potomac River: NAS, Patuxent River, Md.	51	38	0.7
Severn River: Naval station, Annapolis, Md.	43	40	.9
First naval district: NAS, Quonset Point, R. I.	30	35	1.2
Third naval district: Naval shipyard, Brooklyn, N. Y.	29	37	1.3
Fifth naval district:			
Dispensary, Camp Lejeune, N. C.	32	36	1.1
MCAS, Cherry Point, N. C.	32	33	1.0
PhibBase, Little Creek, Va.	59	57	1.0
NAS, Norfolk, Va.	95	96	1.0
Naval station, Norfolk, Va. ³	43	52	1.1
Naval receiving station, Norfolk, Va. ⁴	23	36	1.6
Seventh naval district:			
Naval station, Green Cove Springs, Fla.	52	57	1.1
NAS, Jacksonville, Fla.	98	87	.9
Eighth naval district:			
NAS, Corpus Christi, Tex.	39	32	.8
NATB & NAS, Pensacola, Fla.	97	96	1.0
NATTC, Memphis, Tenn.	80	69	.9
Dist. HQ & NavSta, New Orleans, La.	18	34	1.9
Ninth naval district: NTC, Great Lakes, Ill.	77	77	1.0
Eleventh naval district:			
MT & RD, Oceanside, Calif.	29	76	2.6
NAS, San Diego, Calif.	103	104	1.0
NavRecSta, San Diego, Calif.	68	100	1.5
NTC, San Diego, Calif.	89	92	1.0
NAAS, San Ysidro, Calif.	28	30	1.1
Twelfth naval district:			
NAS, Alameda, Calif.	39	37	1.0
Naval Hospital, Oakland, Calif. ⁵	53	41	.8
Nav Sta, Treasure Island, San Francisco, Calif.	95	107	1.1
Thirteenth naval district: NAS, Whidbey Island, Calif.	28	47	1.7

¹ Prepared from Navmed 171, second quarter, 1948, by the Medical Statistics Division, Bureau of Medicine and Surgery.

² Original admissions (A's) only—Navmed 582.

³ No report received from this activity after May 1948.

⁴ No report received from this activity until June 1948.

⁵ Total includes staff and patients received from transfer.

Table 8 also indicates the ratio, by naval districts, between new admissions for venereal disease and the number of contact reports resulting in location of contacts. Theoretically, on the basis of this ratio, for every 5 infections, 1 contact is located. In terms of the treatment index, for every 10 infected personnel, 1 infected contact is brought to treatment.

The value of training contact interviewers will be further demonstrated by the increasing epidemiological and treatment indices.

DISCUSSION

The Navy participates in contact reporting for the purpose of bringing contacts of infected personnel to early diagnosis and treatment, and in addition, holds to the premise that by this means the reservoir of infection to which Navy and Marine Corps personnel are exposed in the civilian community can be reduced. Indications exist that the results of this method of venereal disease control are not as efficient as desired.

A conscientious and well-conducted interview by a trained contact interviewer appears to be the key to success. Whenever possible and practical, personnel infected with venereal disease should be interviewed by trained personnel.

SUMMARY

1. The inadequacy of information on contact reports is a reason for unsuccessful contact investigation.
2. Means of measuring the efficiency of interviewers have been described.
3. Variation is observed in the investigative activity of civilian health departments. Approximately one-third of Navy contact reports are not returned by health departments so that an evaluation of these reports is impossible. Equal emphasis appears to be placed on the investigation of contacts of patients having syphilis and gonorrhea.



Clinical Case for Diagnosis

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GEORGE S. ELLIS, *Lieutenant, junior grade (MC) U. S. N.*

A 22-year-old Negro male was admitted to a U. S. Naval Hospital complaining of nausea, vomiting, and peri-umbilical pain which began 24 hours previously and was followed by a constant dull peri-umbilical pain. The pain did not radiate and was slightly relieved by leaning forward in a sitting position. He had vomited many times and was unable to retain even liquids. He had had no bowel movements since the onset of the pain. There was a similar episode 2 years previously, which subsided after 4 days.

He had had the usual childhood diseases and jaundice at the age of 14. There was no history of alcoholism or exposure to toxic agents.

Physical examination revealed a tense, well-developed, well-nourished Negro male. Pulse, 96; temperature, 99.2° F.; respirations, 16; and blood pressure, 134 systolic and 86 diastolic. The skin was dry with good turgor; the tongue was coated and the breath fetid; examination of the heart and lungs was negative; and there was voluntary rigidity of the rectus muscles and peri-umbilical tenderness without rebound tenderness.

Laboratory examinations on the day of admission revealed a red blood cell count of 6,000,000; hemoglobin, 17.5 gm. per cu. mm.; white blood cell count, 13,100 with 80 percent neutrophils; urine, specific gravity 1.040 with 500 mg. albumin per 100 cc., 1 gm. sugar per 100 cc., and the sediment showed numerous granular and hyaline casts and 6 to 8 red blood cells per cu. mm.; serum amylase, 364 Somogyi units; and fasting blood sugar, 192 mg.

On the second hospital day, the patient's condition was worse. He had a feeble, rapid pulse, varying between 130 and 150. The temperature was 97.8° F. The systolic pressure varied between 130 and 80 mm. of mercury and the diastolic between 80 and 40 mm. of mercury. At times the blood pressure was unobtainable. Following intravenous blood plasma and fluids the blood pressure returned to 130/90. The abdomen was distended and there were very few peristaltic sounds. Urinalysis showed 2 gm. sugar per 100 cc., and small amounts of albumin and acetone. Fasting blood sugar, 230 mg.; and serum amylase, 312 Somogyi units.

Therapy included Wangensteen suction, rectal tube, and prostigmine for the distention, and penicillin and parenteral fluids. Roentgenogram of the abdomen showed no free peritoneal air and no evidence of intestinal obstruction.

The patient's condition on the third hospital day was similar to that of the second day.

On the fourth day the temperature was 101° F., pulse varied between 150 and 180. He was irrational at times. Glycosuria, 4.5 gm. per 100 cc. and hyperglycemia of 306 mg. per 100 cc. persisted despite the administration of 25 units of regular insulin. The serum amylase was 227 Somogyi units; white blood

cell count, 14,500 with 13 juveniles, 40 band forms, 38 segmented cells, 4 lymphocytes, and 5 monocytes.

By the fifth hospital day the patient was comatose and the respirations were rapid and shallow. During the previous 24 hours, 125 units of regular insulin had been administered, but marked glycosuria and acetonuria persisted. The patient died at 0858.

DIFFERENTIAL DIAGNOSIS

The diagnosis lies among those diseases which can produce an acute condition within the abdomen associated with glycosuria, hyperglycemia, and sudden abdominal pain, in an apparently healthy young male. Among these are: (a) acute pancreatic necrosis; (b) suppurative pylephlebitis; (c) coronary occlusions; and (d) early pneumonia with diaphragmatic pleurisy. Also to be considered is diabetes mellitus concurrent with any of the following acute abdominal conditions: acute upper intestinal obstruction; perforated peptic ulcer; mesenteric vessel embolism or thrombosis; acute cholecystitis; and acute appendicitis.

The important diagnostic feature in this case was the elevated serum amylase. This finding favors the diagnosis of acute pancreatitis. This is a disease of sudden onset characterized by nausea, vomiting, severe upper abdominal pain and collapse, occurring in healthy and robust persons. The serum amylase is commonly elevated early in this disease and is useful in the differentiation from other upper abdominal diseases. This patient showed acetonuria, glycosuria, and an uncontrollable hyperglycemia which also places the pancreas under suspicion. During the second hospital day great difficulty was met in combatting continuing shock. On the third hospital day he developed abdominal distention, slight generalized rigidity, and a silent abdomen. The patient's condition became worse, and on the sixth hospital day he became dyspneic, comatose, and died. The shocklike state, the spreading peritonitis, and the rapid progression of the disease are the usual features of an acute pancreatic necrosis. There was a history of a similar episode 2 years previously which required hospitalization but subsided in 4 days. This is not an unusual occurrence in the past history of cases of acute hemorrhagic pancreatitis.

Roentgenograms of the abdomen failed to reveal any fluid or gas levels or any other evidence of intestinal obstruction.

In the male common conditions producing upper abdominal symptoms are acute cholecystitis, perforated peptic ulcer, and acute appendicitis. This patient did not give a previous history suggestive of gallbladder disease. In acute cholecystitis there is a characteristic muscular spasm associated with severe pain in the right upper abdominal quadrant.

In perforated peptic ulcer there is usually marked muscular rigidity and a rapid pulse rate. Roentgenograms of the abdomen usually re-

veal air under the diaphragm. However, there is the possibility of a chronic peptic ulcer perforating posteriorly into the pancreas and causing an acute pancreatitis.

The course of the disease was unlike that of acute appendicitis. The pain and tenderness failed to localize in the right lower quadrant. The possibility of a suppurative pylephlebitis complicating acute appendicitis or some other intra-abdominal inflammatory lesion must be considered. However, the presence of such a process can be ruled out by the absence of any appreciable rise in the temperature. Multiple pyogenic liver abscesses are frequently seen in suppurative pylephlebitis and the absence of liver tenderness or jaundice in this case tends to eliminate this disease.

Embolism of a branch of the superior mesenteric artery or thrombosis of a mesenteric vein may give rise to an acute condition within the abdomen. Mesenteric artery embolism is usually a complication of subacute bacterial endocarditis. In this case there were no physical findings or history suggestive of endocardial involvement. Mesenteric vein thrombosis is, as a rule, the result of either abdominal injury or some inflammatory intra-abdominal condition. The history was negative for any abdominal injury, and as has been mentioned, the picture was not that of an acute inflammatory process. In either embolism or thrombosis there is usually hematemesis and/or passage of blood per anum.

The age of the patient and the absence of any demonstrable organic cardiac findings tend to eliminate coronary occlusion.

Early pneumonia with diaphragmatic pleurisy is a remote possibility, but since there was no great rise in temperature and the lung findings were negative this possibility was ruled out.

The resistance of the hyperglycemia and the glycosuria to insulin therapy eliminated diabetes mellitus complicated by some concurrent acute abdominal disease.

In none of the above mentioned diseases except acute pancreatitis is there an elevated serum amylase. A serum amylase of double the normal value is considered pathognomonic of acute pancreatitis.

Clinical diagnoses.—Acute hemorrhagic pancreatitis with an uncontrollable diabetes, generalized peritonitis, and severe toxemia.

PATHOLOGICAL DISCUSSION

The outstanding autopsy findings were: an acute hemorrhagic and necrotizing pancreatitis (fig. 1), acute diffuse chemical peritonitis, and extensive fat necrosis. The pancreas was enlarged to approximately six times the normal size. It was of firm consistency throughout and cut with increased resistance in the nonnecrotic areas. The external and sectioned surfaces presented alternating gray red and dark red

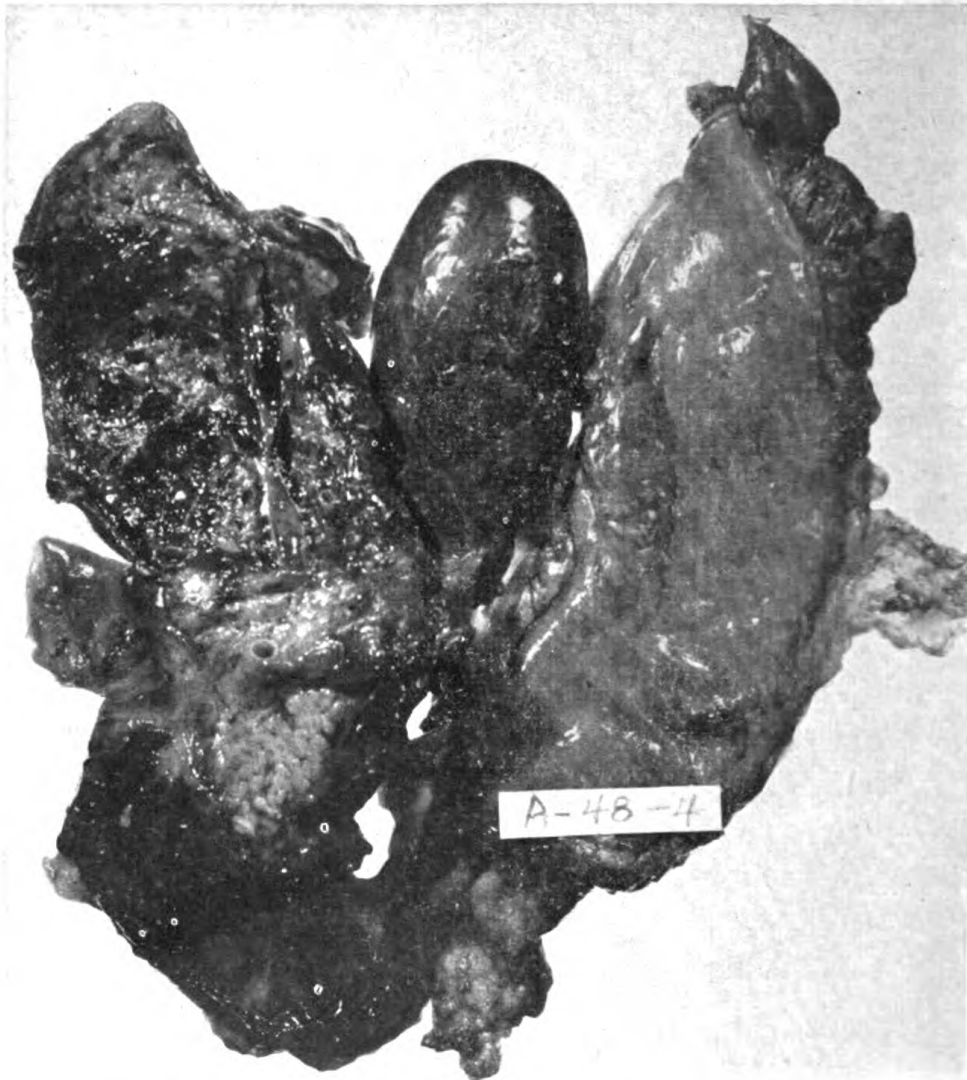


Figure 1.—Acute hemorrhagic pancreatic necrosis involving particularly the body and tail. (The gallbladder has been placed behind and below the pancreas for photographic purposes.)

areas. Smaller areas of grayish-green necrotic tissue were also present; the normal lobular architecture was lost. Only a few small isolated lobules of normal appearing pancreatic tissue were seen. The pancreatic ducts were markedly dilated and, in the main, were patent throughout. There was, however, a dense fibrous band causing partial constriction of the duct of Wirsung at the point where it joined the common bile duct. The abdominal cavity contained approximately 300 cc. of sanguineous, nonodorous fluid. The peritoneum, omentum, and mesentery were covered by small, discrete, yellowish-white areas of fat necrosis, varying in size from 0.2 to 3.0 cm. Similar,

but much less extensive, fat necrosis was seen in the left pleural space. The kidneys were slightly increased in weight and appeared somewhat pale. The remaining organs presented no abnormal findings.

Microscopically, sections of the pancreas showed extensive areas of hemorrhage and necrosis (fig. 2). Only a few small areas remained in which relatively normal acinar tissue could be recognized. In these areas there was increased interstitial fibrous connective tissue and considerable fibroblastic activity indicating previous inflammation. Most of the blood vessels were thrombosed and their walls were necrotic.

Sections from the gross lesions noted in the fat, from various parts of the abdominal cavity, and from the pleura showed them to be largely necrotic, hemorrhagic, and edematous, and diffusely infiltrated by polymorphonuclear leukocytes and macrophages. Sections of kidneys showed swelling of Bowman's membrane and thickening of the capillary tufts. There was marked cloudy swelling of the tubular epithelium with sloughing into the lumina which were filled with eosinophilic albuminous precipitate. No definite evidence of localized necrosis of the lower nephron segments was noted.

Pathological diagnoses.—(a) Acute hemorrhagic and necrotizing pancreatitis; (b) acute diffuse chemical peritonitis; (c) fulminating diabetes mellitus; (d) toxic nephrosis; (e) hemorrhagic pleuritis, left, with hydrothorax and fat necrosis; and (f) stricture of the duct of Wirsung.

The pathogenesis in this case is probably best explained on the partial congenital atresia of the duct of Wirsung. No calculi were present and there was no microscopic evidence of an existing duodenitis or metaplasia of the pancreatic ductal epithelium which are etiologic factors in acute pancreatic necrosis. That the episode four years previously was a similar, but much less severe, attack of pancreatitis is evidenced by the extensive pancreatic fibrosis.

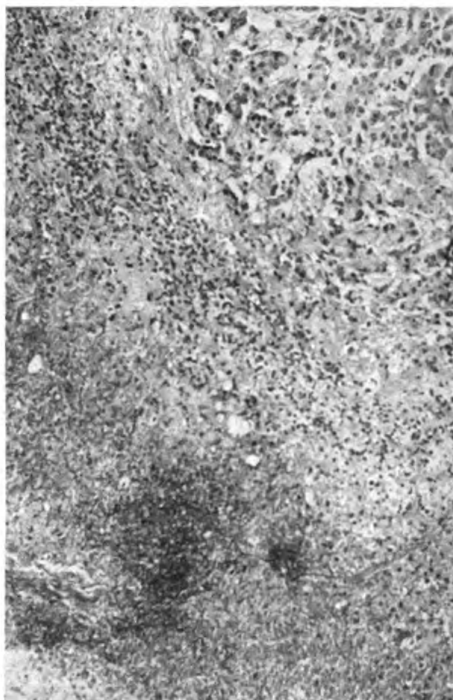


Figure 2.—Hemorrhage and necrosis in upper left, with more normal pancreatic tissue in the lower right field.

The important diagnostic laboratory finding in this case was the initial high serum amylase. The uncontrollable diabetes with the marked hyperglycemia and glycosuria can be explained by the extensive pancreatic necrosis and the destruction of most of the Islets of Langerhans. This uncommon complication is a poor prognostic sign and is thought to be directly proportional to the amount of pancreatic destruction. The reason for the sustained high blood sugar levels in spite of repeated doses of insulin is not known, but it occurs in a small percentage of cases of acute pancreatitis. The necrosis of the abdominal fat was the result of the liberation of pancreatic enzymes, particularly lipase. The involvement of the pleural fat can be explained by the transportation of lipase through the diaphragm via the lymphatics.

The toxic nephrosis was the result of the attempt on the part of the kidneys to excrete the toxic products of tissue destruction. The histological picture in the kidneys was one of "cloudy swelling" with some sloughing of the tubular epithelium. It was not the advanced picture of focal tubular necrosis seen in lower nephron nephrosis, which may occur in these cases. However, it is felt that had the patient lived a few more days he would have undoubtedly exhibited the typical lower nephron findings.



Under the spreading chestnut tree
Is Not the place to stack your Jack!
The smart guy buys his Savings Bonds . . .
And 4 for 3's what he gets back



THE PHYSICIAN MUST KNOW
WHAT HIS PREDECESSORS HAVE
KNOWN IF HE DOES NOT WISH TO
DECEIVE BOTH HIMSELF AND
OTHERS.—*Hippocrates*.

EDITORIALS



Intravenous Procaine

The intravenous administration of procaine hydrochloride has been long regarded as hazardous—delirium or fatal convulsions may occur after comparatively small amounts of procaine are injected intravenously. Bier, in 1909, administered procaine intravenously and produced local anesthesia but he applied a tourniquet to the extremity to prevent the entrance of the anesthetic into the general circulation. Recent clinical observations show that comparatively large amounts of procaine hydrochloride can be administered intravenously if given slowly and in a sufficiently dilute solution.

At the present time the therapeutic use of intravenous procaine is widespread. It is administered to overcome post-operative pain, the pain of musculo-skeletal injuries, of burns, of angina pectoris, as an analgesic in labor, and to relieve muscle spasm in poliomyelitis. The direct action of procaine on the arterioles and capillaries produces vasodilatation and this is probably the reason for its use in vascular diseases, such as intermittent claudication, coronary artery disease, Buerger's disease, thrombophlebitis, and pulmonary embolism.

Procaine, because of its quinidinelike action is effective in overcoming auricular fibrillation or the cardiac arrhythmia which may occur during cyclopropane anesthesia or following an injection of adrenalin. Also, procaine is effective in establishing normal rhythm in ventricular fibrillation. The antihistaminic effect of procaine makes it an effective therapeutic agent in status asthmaticus, delayed serum sickness, and in other allergic phenomena. Durieu, de Clercq, and Duprez administered from 5 to 20 cubic centimeters of a 1 percent solution of procaine hydrochloride intravenously in 25 asthmatic patients who had neither emphysema nor chronic bronchitis. Lasting benefits were noted in 50 percent while in 30 percent temporary improvement was noted. If the asthma was accompanied with emphysema and bronchitis only 30 percent showed temporary improvement. Neither the

allergic state nor the neurovegetative disturbance is influenced by procaine hydrochloride.

Procaine is destroyed almost instantaneously by an enzyme in the plasma, into its metabolites, di-ethyl-amino-ethanol, and para-amino-benzoic acid. It appears that only the di-ethyl-amino-ethanol equivalent is responsible for the therapeutic effect of procaine. This fraction overcomes muscular spasm because of its anesthetic properties, and is effective in overcoming cardiac arrhythmia. The toxic effects of di-ethyl-amino-ethanol are similar to those noted in mild procaine reaction, and consist of vertigo, slurred speech, a feeling of warmth, nausea and mild retching, and mild hypotension. A 10 percent solution of di-ethyl-amino-ethanol produces local anesthesia for from 20 to 30 minutes. There are no anesthetic effects if a 1 percent solution is used. With 3 to 4 grams di-ethyl-amino-ethanol administered intravenously the skin temperature increases from 3 to 9 degrees Centigrade.

Procaine is administered at the rate of 4 milligrams per kilo and is given in an 0.1 percent solution in isotonic saline over a period of 20 minutes. This dose of procaine is eliminated from the blood stream in 20 minutes. If a prolonged effect is desired the administration of procaine should be repeated or else the procaine must be administered over a longer period of time. In emergencies such as ventricular fibrillation, angina pectoris, pulmonary embolism, or status asthmaticus, 100 milligrams of procaine hydrochloride in a 1 percent solution may be given as a single injection. Convulsions must be closely watched for and a 2½ percent solution of pentothal sodium must be given as an antidote. Vitamin C and the barbiturates are given simultaneously with the intravenous procaine. It has been noted that deficiency of vitamin C augments the tendency to convulsions, and that the barbiturate will overcome convulsions. Procaine given at the rate of 10 to 13 cubic centimeters of a 1 percent solution per minute will produce a central effect with dimming of consciousness.

The individual hypersensitive or allergic to procaine can be found by preliminary skin testing.

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2. DURIEU, H.; DE CLERCQ, F.; and DUPREZ, A.: Treatment of asthma with intravenous administration of procaine hydrochloride. *Acta clin. belg., Brussels*, 1: 97-196, Mar. 1946.
3. ROVENSTEIN, E. A., and PAPPER, E. M.: The therapeutic role of procaine and its derivatives. *Bull. New York Acad. Med.* May 1949.



Stimulants in Anoxia

Weyl (1) states that although carbon dioxide is a powerful respiratory stimulant under normal conditions it is not a stimulant to the severely depressed respiratory center and adds to the depression; Coramine, Metrazol, and Picrotoxin by increasing the oxygen demand of the higher centers aggravate the anoxia; therefore, no carbon dioxide or other stimulant should be administered in anoxia or in the dyspnea and cyanosis from atelectasis. In atelectasis stimulants should not be given but the patient should be made to cough in order to inflate the lungs and then carbon dioxide should be given in order to stimulate deep breathing, provided the respiratory center is not depressed. Anoxia of the brain for 5 seconds produces unconsciousness and death occurs after 5 minutes.

REFERENCE

1. WEYL, R.: Modern trends in anesthesia. *J. Indiana M. A.*, 42: 425-433. May 1949.



Physical Characteristics of Recruits

The Medical Statistics Division of the Bureau of Medicine and Surgery reports some interesting facts regarding height, weight, blood pressure and vision of youths in the 17-, 18-, 19-, and 20-year age groups.

The data are based on the initial physical examination of 6,129 Navy and Marine Corps recruits. Table 1 shows the age distribution of the number examined.

Table 2 shows the distribution by race.

The distribution of the ages of the recruits is shown in table 1. A large majority, 92.9 percent, of the recruits were under 20 years of age.

TABLE 1.—Age distribution of 6,121¹ Navy and Marine Corps recruits, by type of service

Age ²	Total		Navy		Marine Corps	
	Number	Percent of total	Number	Percent of total	Number	Percent of total
Total.....	6,121	100.0	5,019	100.0	1,073	100.0
17.....	3,015	49.3	2,477	49.4	524	48.8
18.....	1,995	32.6	1,645	32.8	340	31.7
19.....	673	11.0	542	10.8	129	12.0
20 and over.....	438	7.1	355	7.0	80	7.5

¹ Excludes 8 whose date of birth was not reported on NAVMED H-2. The total column includes 29 for whom the type of service was not reported.

² Age is based upon year of birth only, and is the age at the time of induction—September 1947.

TABLE 2.—*Distribution by race*

Item	Number	Percent of total
<i>Race</i>		
White.....	5,927	96.7
Other than white.....	173	2.8
Not reported.....	29	.5

HEIGHT

It is to be observed in table 3 that 89.4 percent of the recruits were within the height range of 65 to 72 inches. The average height of all the recruits was 68.5 inches.

TABLE 3.—*Height distribution of 6,113¹ Navy and Marine Corps recruits*

Height in inches	Number	Percent of total	Height in inches	Number	Percent of total
Total.....	6,113	100.0	68.....	962	15.7
61 and under.....	17	.3	69.....	971	15.9
62.....	25	.4	70.....	801	13.1
63.....	79	1.3	71.....	604	9.9
64.....	182	3.0	72.....	361	5.9
65.....	346	5.7	73.....	183	3.2
66.....	590	9.6	74.....	93	1.5
67.....	834	13.6	75 and over.....	55	.9

¹ Excludes 16 whose height was not reported on NAVMED H-2.

NOTE.— Fractions of an inch smaller than $\frac{1}{2}$ were dropped while fractions $\frac{1}{2}$ inch or greater were raised to 1 inch.

WEIGHT

The weight distribution of all the recruits is shown in table 4; the weights in 92.2 percent of the recruits were within the range of 110 and 169 pounds. The average weight of recruits was 140.6 pounds; the average weight of Marine Corps recruits was 143.2 pounds, which is 3.3 pounds heavier than the average weight of Navy recruits, 140.0 pounds.

TABLE 4.—*Weight distribution of 6,106¹ Navy and Marine Corps recruits*

Weight in pounds	Number	Percent of total	Weight in pounds	Number	Percent of total
Total.....	6,106	100.0	160-169.....	471	7.7
100-109.....	91	1.5	170-179.....	182	3.0
110-119.....	527	8.6	180-189.....	92	1.5
120-129.....	1,057	17.3	190-199.....	61	1.0
130-139.....	1,461	24.0	200-209.....	33	.5
140-149.....	1,283	21.0	210-219.....	11	.2
150-159.....	829	13.6	220-229.....	8	.1

¹ Excludes 23 whose weights were not reported on NAVMED H-2.

NOTE.— In coding the weights of the recruits, fractions of a pound were dropped.

BLOOD PRESSURE

Table 5 shows that in 86.5 percent of the systolic blood pressure readings, 36.2 percent were in the interval of 115 to 124. Only 0.4 percent were above 144.

TABLE 5.—*Distribution of systolic blood pressure reading of 6,076¹ Navy and Marine Corps recruits*

Systolic blood pressure (millimeters of mercury)	Number	Percent of total
Total.....	¹ 6,076	100.0
94 and under.....	7	.1
95-104.....	205	3.4
105-114.....	1,185	19.5
115-124.....	2,200	36.2
125-134.....	1,658	27.3
135-144.....	793	13.1
145 and over.....	28	.4

¹ Excludes 53 for whom the systolic blood pressure reading was not reported on NAVMED H-2.

NOTE.—In coding the systolic blood pressure readings, it was apparent from the tabulation of the data that a large proportion of the readings had been rounded to the nearest 10. Because of this concentration on multiples of 10, the data have been compiled in intervals of 10 with the midpoint at 10. This same limitation applied to the diastolic blood pressure readings.

In table 6, it may be seen that 92.9 percent of the diastolic blood pressure readings were below 84. Only 7.0 percent of the readings were above 84. A majority of the diastolic blood pressure readings, 90.6 percent, were within the range of 55 and 84.

TABLE 6.—*Distribution of diastolic blood pressure readings of 6,068¹ Navy and Marine Corps recruits*

Diastolic blood pressure (millimeters of mercury)	Number	Percent of total
Total.....	¹ 6,068	100.0
44 and under.....	16	.3
45-54.....	125	2.1
55-64.....	1,102	18.2
65-74.....	2,478	40.8
75-84.....	1,919	31.6
85-94.....	416	6.8
95 and over.....	12	.2

¹ Excludes 61 for whom the diastolic blood pressure was not reported on NAVMED H-2.

PULSE RATE

A large percentage of the recruits (83.5 percent) had a pulse rate of between 67 and 86 beats per minute; three-fourths had a pulse rate below 83 (table 7).

TABLE 7.—*Distribution of the pulse rates of 6,083¹ Navy and Marine Corps Recruits*

Pulse rate before exercise	Number	Percent of total
Total.....	¹ 6,083	100.0
58 and under.....	10	.2
59-62.....	57	.9
63-66.....	116	1.9
67-70.....	693	11.4
71-74.....	1,477	24.3
75-78.....	1,145	18.8
79-82.....	1,076	17.7
83-86.....	684	11.3
87-90.....	526	8.6
91-94.....	167	2.7
95 and over.....	132	2.2

¹ Excludes 46 for whom the pulse rate was not reported on NAVMED H-2.

VISUAL ACUITY

Ninety-one and two tenths percent of the recruits had a visual acuity of 20/20 or better in the right eye and 91.4 percent had a visual acuity of 20/20 or better in the left eye. Of the total 88.4 percent could see as well or better than normal in both eyes and 93.5 percent had a visual acuity of 15/20 or better in both eyes (table 8).

TABLE 8.—*Distribution of the visual acuity measurements of 6,108¹ Navy and Marine Corps recruits*

Vision right eye	Vision left eye									
	Number					Percent of total				
	Total	20/20 or better	15/20 to 19/20	10/20 to 14/20	Under 10/20	Total	20/20 or better	15/20 to 19/20	10/20 to 14/20	Under 10/20
Total.....	¹ 6,108	5,584	252	162	110	100.0	91.4	4.1	2.7	1.8
20/20 or better.....	5,570	5,397	111	47	15	91.2	88.4	1.8	.8	.2
15/20 to 19/20.....	236	107	96	29	4	3.9	1.7	1.6	.5	.1
10/20 to 14/20.....	169	52	37	50	30	2.7	.8	.6	.8	.5
Under 10/20.....	133	28	8	36	61	2.2	.5	.1	.6	1.0

¹ Excludes 21 for whom the vision was not reported on NAVMED H-2.

NOTE.—Vision was expressed as a fraction, of which the numerator was the distance at which Snellen's 20-foot test letters could be determined, and the denominator 20. When vision was better than normal, the denominator was 15 or 10 as the case might be. Thus 20/20 indicated normal vision, 15/20 less than normal, and 20/15 or 20/10 better than normal. For tabulating purposes the original measurements were grouped as follows: 20/20 or better, 15/20-19/20, 10/20-14/20, and under 10/20.



Maternal Mortality: United States and Each State, 1947

Maternal mortality decreased to a new low in the United States during 1947, according to figures released by the National Office of Vital Statistics of the Public Health Service, Federal Security Agency. The maternal mortality rate was 1.3 per 1,000 live births in 1947 as compared to 1.6 in 1946. The number of maternal deaths (associated with diseases of pregnancy, childbirth, and the puerperium) also decreased from 5,153 deaths in 1946 to 4,978 in 1947, despite the tremendous increase in the number of births.

In 1947, the maternal mortality rate for white women was 1.1 per 1,000 live births, while that for nonwhite women was 3.3, or 3 times as great.

The risk of dying associated with childbearing has been declining steadily since 1933, the first year in which data are available for the entire continental United States. From 6.2 in 1933, the maternal mortality rate decreased 79 percent to 1.3 in 1947. Maternal mortality decreased more rapidly among white than nonwhite women. The mortality rate for the white race decreased 80 percent, from 5.6 in 1933 to 1.1 in 1947, and the rate for the nonwhite races decreased 66 percent in this period, from 9.7 to 3.3. (table 1).

TABLE 1.—*Number of maternal deaths and maternal mortality rates, by race: United States, 1933-47*

[Maternal deaths are deaths from causes associated with pregnancy, childbirth, and the puerperium. Rates per 1,000 live births]

Year	Number			Rate		
	Total	White	Nonwhite	Total	White	Nonwhite
1947.....	4,978	3,555	1,423	1.3	1.1	3.3
1946.....	5,153	3,807	1,346	1.6	1.3	3.6
1945.....	5,668	4,122	1,546	2.1	1.7	4.5
1944.....	6,369	4,648	1,721	2.3	1.9	5.1
1943.....	7,197	5,463	1,734	2.5	2.1	5.1
1942.....	7,267	5,515	1,752	2.6	2.2	5.4
1941.....	7,956	5,864	2,092	3.2	2.7	6.8
1940.....	8,876	6,614	2,262	3.8	3.2	7.7
1939.....	9,151	6,995	2,156	4.0	3.5	7.6
1938.....	9,953	7,566	2,387	4.4	3.8	8.5
1937.....	10,769	8,400	2,369	4.9	4.4	8.6
1936.....	12,182	9,627	2,555	5.7	5.1	9.7
1935.....	12,544	10,018	2,526	5.8	5.3	9.5
1934.....	12,859	10,154	2,705	5.9	5.4	9.0
1933.....	12,885	10,118	2,767	6.2	5.6	9.7

For the individual States the maternal mortality rates in 1947 ranged from 0.6 deaths per 1,000 live births for residents of Minnesota to 2.6 for residents of Alabama, Mississippi, and South Carolina. In the United States as a whole, almost all the States and the District of Columbia show decreases in rates from 1946 to 1947. In comparing

State maternal mortality rates, consideration must be given to the fact that many of the rates are based on very small numbers of deaths, so that a difference of a few deaths may result in a relatively large difference in the rate. Therefore, in making comparisons of State rates, or of annual changes in these rates, it must be considered that observed differences in the rates may be due to this factor rather than to true differences in maternal mortality. Another factor to be considered is the completeness of both birth and death registrations which varies considerably from State to State.



OFFICERS OF THE MEDICAL DEPARTMENT

Whose Deaths Have Been Reported Since the Last Issue of the Bulletin

BRADY, EMMETT JAMES, Captain (MC) U. S. N. (Retired, Inactive). Died 8 July 1949 at the U. S. Naval Hospital, Bremerton, Wash.

CASTO, DOW HOLMES, Lieutenant Commander (MC) U. S. N. (Retired, Inactive). Died 22 May 1949 at the U. S. Naval Hospital, Mare Island, Calif.

CONNER, MARIE ELIZABETH, Lieutenant, junior grade (NC) U. S. N. R. (Inactive). Died 28 December 1946 at Baltimore, Md.

DAVID, GLENN "E", Lieutenant (HC) U. S. N. (Retired, Inactive). Died 19 March 1949 at Cathedral City, Calif.

HODGE, IDA LEWELLYN, Lieutenant, junior grade (NC) U. S. N. Died 23 April 1949 at the U. S. Naval Hospital, Bethesda, Md.

HROSTRSKI, JULIUS "J", Lieutenant Commander (DC) U. S. N. R. (Inactive). Died 31 March 1949 at Queens Village, L. I., N. Y.

JONES, ANDREW JEATUS, Lieutenant (DC) U. S. N. R. (Drill status). Died 3 July 1949 at the U. S. Naval Air Station, Willow Grove, Pa.

PARKER, ARTHUR DOUGLAS, Captain (MC) U. S. N. R. (Retired, Inactive). Died 18 June 1949 at De Paul Hospital, Norfolk, Va.

ROGSTAD, OTTO VALDEMAR, Lieutenant (DC) U. S. N. (Retired, Inactive). Died 18 May 1949 at Redmond, Wash.

THOMPSON, ROBERT WILSON, Lieutenant (DC) U. S. N. R. (Inactive). Died 30 March 1949 at Beaumont, Calif.

YORK, JUSTIN ORPHUS, Lieutenant Commander (MC) U. S. N. R. (Active). Died 5 July 1949 at the U. S. Naval Hospital, Long Beach, Calif.

BOOK REVIEWS AND BOOKS RECEIVED



Publishers submitting books for review are requested to address them as follows:

The Editor,

UNITED STATES NAVAL MEDICAL BULLETIN.

Bureau of Medicine and Surgery, Navy Department,
Washington 25, D. C.

(For review)

NOTES: Books marked by symbol ① or ② meet the library requirements for personnel training and are recommended by the Advisory Board, Bureau of Medicine and Surgery.

Symbol ① indicates that the book is recommended for naval hospitals; and symbol ② for dispensaries, dependents service, and medical departments of ships.

CURRENT THERAPY 1949. Latest Approved Methods of Treatment for the Practicing Physician. Howard F. Conn, M. D., Editor. Consulting Editors: M. Edward Davis; Vincent J. Derbes; Garfield G. Duncan; Hugh J. Jewett; William J. Kerr; Perrin H. Long; H. Houston Merritt; Paul A. O'Leary; Walter L. Palmer; Hobart A. Riemann; Cyrus C. Sturgis; and Robert H. Williams. 672 pages. W. B. Saunders Co., Philadelphia, Pa., publishers, 1949. Price \$10.

This informative volume is a compilation of various up-to-date methods of treatment set forth in a concise and specific manner by several authors.

Twelve consulting editors collaborate to make this a practical and valuable treatise. Infectious Diseases, Diseases of the Digestive System, Metabolism, Endocrine System, Urogenital System, Venereal Disease, Allergy, Skin Diseases, Diseases of the Respiratory System, Cardiovascular System, Blood and Spleen, Nervous System, and Obstetrical and Gynecologic Conditions and Diseases due to physical and chemical agents, are included.

Diet, prophylaxis, physiotherapy, and symptomatic and preventive treatment are included. Elective and emergency surgical procedure and post-operative care are considered in appendicitis, cholecystitis, regional ileitis, peptic ulcer, tracheotomy, tumors of stomach and intestines, urogenital conditions, and obstetrics and gynecology.

The double column format makes for easy reading. The index includes authors and subjects.

This is an excellent ready reference for the general practitioner, resident, and intern, and a valuable addition to his armamentarium.

HANDBOOK OF PHYSIOLOGY AND BIOCHEMISTRY (Originally "Kirkes" and later "Halliburton's"), by R. J. S. McDowall, M. D., D. S. C., *Professor of Physiology, University of London, King's College*. 39th edition. 898 pages, illustrated. The Blakiston Co., Philadelphia, Pa., publishers, 1946. Price \$7.

The original author of this book was William Senhouse Kirkes when the first edition appeared in 1848, the title being "Kirkes' Physiology." Later, in 1896, the book was entirely rewritten by Professor Halliburton of King's College. Dr. McDowall has had the sole responsibility for the book since 1930 and at present it is almost entirely his work.

This is an excellent reference book in the fields of physiology and biochemistry. It is written in a clear, concise manner which makes it extremely readable. One of the interesting features of the book is the analogies used by the author which simplify many of the intricate physiological and biological processes. The technician, as well as the specialist, should find the book most valuable. Numerous models and diagrams throughout the book are well chosen. Physiology and biochemistry are discussed simultaneously rather than in separate sections, thus making the subjects more easily correlated with one another. The complete descriptions as to how various physiological and biological functions were determined are comprehensive and interesting. Chapters on the nervous, circulatory, and respiratory systems are particularly well-written.

This book is of great value to the specialist and the technician.—*Lt. B. F. Burgess, Jr. (MSC) U. S. N.*

HISTOPATHOLOGIC TECHNIC, by R. D. Lillie, A. B., M. D., *Medical Director, U. S. Public Health Service; Chief, Pathology Laboratory, National Institute of Health*. 300 pages. The Blakiston Company, Philadelphia, Pa., publishers, 1948. Price \$4.75.

This book contains the most up-to-date histopathologic technic available. Most of the methods have been tested by Dr. Lillie, and have proved workable. There are excellent chapters on such general subjects as microscopes, equipment, fixation, sectioning, stains, and staining. Following these general subjects are chapters on staining of specific substances as enzymes, pigments, fats, lipoids, and many others. There is not merely a listing of accepted staining methods, but also critical comments on the advantages and limitations of the methods. In addition, there are comments on the chemistry of many tissues. The directions for staining are explicit and should be easily followed.

The book is well documented, complete, and obviates search of the literature for various technics. The book is highly recommended.—*Commander W. W. Ayres (MC) U. S. N.*

RECONSTRUCTIVE AND REPARATIVE SURGERY, by Hans May, M. D., F. A. C. S., *Assistant Professor of Surgery, Graduate School of Medicine, University of Pennsylvania; Associate Surgeon, Lankenau Hospital, Children's Hospital of the Mary J. Drexel Home, and Chestnut Hill Hospital; Surgeon, Germantown Hospital; Consulting Plastic Surgeon, Abington Memorial Hospital, Memorial Hospital (Roxborough), Misericordia Hospital, Nazareth Hospital, and St. Christopher's Hospital for Children*. Foreword by James Barrett Brown, M. D., F. A. C. S. 964 pages, 963 illustrations, 17 in color. F. A. Davis Co., Philadelphia, Pa., publishers, 1947. Price \$15.

In this new book, Dr. Hans May has presented in a compact, cumulative, and comprehensive manner, the principles of plastic and reconstructive surgery which are of interest to the general surgeon. The aim of the book is to present to the general surgeon the basic interrelationship of the reconstructive surgical specialties and to present those methods which have proved satisfactory in practice and end results. The book is planned to make the capabilities of plastic and reconstructive surgery better known to the general surgeon.

The book is divided into three parts; Part I contains detailed information concerned with pre-operative preparations, anesthesia, sutures, general tech-

niques of various grafts, and treatment of wounds, burns, and scar formation. Part II, describes specific techniques of plastic and reconstructive surgery based upon the anatomic features of the various regions of the body. Part III of the book presents in an excellent illustrative manner, a large number of concrete clinical examples demonstrating the possibilities and end results of the various methods described in the text. The drawings, illustrations, and bibliography are excellent. Dr. May's description of operative technique is concise and understandable.

This text book should be on the shelf of every Naval Hospital Library and a part of the armamentarium of the general surgeon who is called upon to perform various types of reconstructive operations.—*Capt. J. J. Wells (MC) U. S. N.*

HUMAN GASTRIC FUNCTION, An Experimental Study of a Man and His Stomach, by Stewart Wolf, M. D., *Assistant Professor of Medicine, Cornell University Medical College, New York Hospital, New York*; and Harold G. Wolff, M. D., *Associate Professor of Medicine, Cornell University Medical College, New York Hospital, N. Y.* Foreword by Walter B. Cannon, M. D. 2d edition. 262 pages, illustrated. Oxford University Press, New York, N. Y., publishers, 1947. Price \$5.

This monograph contains observations made by the authors during their study of various attributes of human gastric function. The observations were obtained by means of direct visualization into the stomach of a patient who had a gastric fistula.

Several modalities of gastric sensation were investigated. The gastric motility, secretion, and blood flow were studied under conditions of varying food materials, varying drugs, and varying emotional states. The data demonstrate amply that the emotional reactions of the individual profoundly influenced and altered his usual responses to variation in food materials or drugs.

It was demonstrated that protracted gastric "hyper-function" (as defined by increased activity observed in those attributes measured) is accompanied regularly by lowering of the pain threshold of the stomach and increased susceptibility to injury of the gastric mucosa. Certain inferences concerning the pathogenesis of gastric ulcer were presented.

Collateral studies were made before and after vagus nerve resection on a second patient with a gastric fistula. It was discovered that this operation produced a marked diminution in the changes in gastric function which were induced by changes in the emotional state of the patient.

This book is recommended for the medical student, the psychiatrist, the internist, and the investigator who is dealing with the physiology, pharmacology, or pathology of the stomach.—*Lt. (jg) L. E. Watters (MC) U. S. N.*

MODERN METHODS OF AMPUTATION, by Edmundo Vasconcelos, *Professor, University of Sao Paulo*, with an Introductory Survey of The Development of Amputation by Major Gen. Norman T. Kirk, M. C., *Surgeon General, U. S. Army*. 253 pages, illustrated. The Philosophical Library of New York, Department of War Medicine, New York, N. Y., publishers, 1945. Price \$10.

This book naturally divides itself into two sections: The first, an introductory survey by Major General Norman T. Kirk, MC, U. S. A., called "The Development of Amputation"; the second and major portion of the book, by Edmundo Vasconcelos, Professor, University of Sao Paulo.

Quoting Hippocrates, "War is the only proper school for the surgeon," General Kirk goes on to discuss the development of amputations from the Edwin Smith Surgical Papyrus to the middle of World War II. His chapter is intensely interesting and instructive, not only to the orthopedic surgeon, but to anyone interested in the development of the amputation.

Vasconcelos has, himself, indicated in the Foreword the possible weaknesses of his text. He admits that his book is didactic, written for the general practi-

tioner, and that those who are endowed with great acumen and learning have no need for it. The highly trained traumatic surgeon would undoubtedly find fault with such a text, believing that amputations are best done only by the highly trained. This objection is largely overruled, when one realizes that in most of the world emergency surgery is still done by the general surgeon or general practitioner.

He has narrowed the section on prostheses to the essentials. This is undoubtedly a wise procedure. So much research is now being done on artificial limbs that an exact delineation of a particular prosthesis may well become outmoded.

The text has been carefully broken into component parts so that anyone may find the indications for a particular procedure, the method of choice, including anesthesia, medication, and exact technique. The excellent and numerous drawings by Filho are anatomically exact and have an esthetic appeal.

This book is recommended to all those who may occasionally do traumatic surgery, and to residents and internes desirous of building a firm base of essential knowledge about amputations.—*Commander H. B. Eisberg (MC) U. S. N.*

AGNOSIA, APRAXIA, APHASIA, by J. M. Nielsen, B. S., M. D., F. A. C. P., *Associate Clinical Professor of Medicine, University of Southern California; Senior Attending Physician in Neurology and Assistant in Neuropathology, Los Angeles County Hospital, Los Angeles, Calif.* 2d edition. 292 pages with 59 illustrations. Paul B. Hoeber, Inc., New York, N. Y., publishers, 1946. Price \$5.

A brief historical introduction to aphasia, agnosia, and apraxia is followed by a discussion of the physiology and anatomy and their correlation to cerebral anatomy and pathologic changes. The disturbances of recognition of identification (the agnosias) and their cerebral localization, and the inability of the patient to apply his powers to voluntary purposes because of motor incapacity (apraxia) are discussed. The aphasias are considered from a new standpoint; the division of aphasia into asphasias on the lower level and aphasias on the higher level. Lower level aphasias involve loss of reminiscence or recall. A higher hierarchy of language, namely semantics and calculation are higher level aphasias. Other discussions include: miscellaneous terms which are not classifiable according to the author's scheme; the body scheme of major and minor sides with its anatomic and physiologic disturbances; the method of examination—not only does he tell you how to apply and what tests to use but he gives you pitfalls to avoid in order not to reach an erroneous conclusion, and terminology, old and new, is defined in relation to the subject and the location of the lesions. The pathologic material is correlated with case histories and post-mortem findings. He does not ascribe apparent specific defects to focal cause when general cerebral dysfunction is present.

For those who wish to study the subject in greater detail there are 2 pages of references and an ample bibliography covering the best references in the literature from 1836 to 1939. The index is adequate. This is an authoritative source of information on agnosia, apraxia, and aphasia and is recommended to anyone interested in aphasia.—*Commander M. T. Yates (MC) U. S. N.*

TOXIC EYE HAZARDS. A Manual prepared by The Joint Committee on Industrial Ophthalmology of the American Medical Association and the American Academy of Ophthalmology and Otolaryngology, Publication No. 494. The National Society for the Prevention of Blindness, Inc., 1790 Broadway, New York 19, N. Y., publishers, 1949. Price \$1.

Toxic Eye Hazards is a manual prepared by The Joint Committee on Industrial Ophthalmology of the American Medical Association and the American Academy of Ophthalmology and Otolaryngology. It represents the most authoritative and up-to-date thinking in the field of eye conservation with particular emphasis on

protection from chemical hazards encountered in various industrial processes—new and old.

The Manual has been so written as to be of value to the laymen and professional personnel dealing with the prevention and care of industrial eye injuries. It covers such subjects as Standards and Tests for Eye Protection Equipment; A Well Organized Eye Protection Program; Tables of Toxic Chemicals (with their effects upon the eye); and Emergency and First Aid Procedures in Chemical Eye Injuries. A discussion of definitive treatment has been purposely omitted. For professional personnel who wish to pursue the subject of Toxic Eye Hazards more fully, there is an extensive bibliography.

Those who are interested in any phase of eye protection and conservation, be they ophthalmologists, medical directors, safety directors, industrial nurses, industrial supervisors, or public health officers, should find this publication of interest and of definite value in the control of eye hazards in general and those of a chemical nature in particular.—*Capt H. K. Sessions (MC) U. S. N.*

OSTEOTOMY OF THE LONG BONES, by Henry Milch, M. D. *Consulting Orthopedist, Maimonides Hospital, Attending Orthopedic Surgeon, Hospital for Joint Diseases and Riverside Hospital, New York; Fellow of the American Academy of Orthopedic Surgeons of the American College of Surgeons of the New York Academy of Medicine.* 294 pages, illustrated. Charles C Thomas, Springfield, Ill., publisher. 1947. Price \$6.75.

Osteotomy of the Long Bones by Henry Milch, M. D., is a 294-page monograph on the theory and practice, with special reference to the mechanics and bio-mechanical aspects of osteotomy.

The first part of the book is devoted to axial displacement, which may occur in straight bones; the second part, principally to the axial displacements of the femur, which may occur in the coronal plane and which has been called the abduction osteotomy.

The book is well-written, but is not all easy reading, since the author includes not only carefully organized step-by-step procedures in various operations, but he also discusses the mechanical relationships of osteotomy by means of trigonometric formula. The author exhibits excellent command of the literature and together with his original ideas, the book is a very refreshing presentation of a subject which is important to all surgeons in orthopedics.—*Lt. (jg) W. P. Horton (MC) U. S. N. R.*

FUNCTIONAL NEURO-ANATOMY, by A. R. Buchanan, M. D., *Professor of Anatomy, University of Colorado School of Medicine, Denver, Colo.* 242 pages with 190 illustrations, 19 in color. Lea & Febiger, Philadelphia, Pa., publishers, 1948. Price \$6.50.

This is a direct and comprehensible book which is a practical guide for the medical student, and a good reference for the house officer and general practitioner.

An introduction to neurology and the clinical application of neuro-anatomy are appropriately introduced in close connection with the neuro-anatomical discussions.

The illustrations are numerous, simple, and well chosen. The various tracts and pathways are described completely the first time they are mentioned. The text is appropriately initiated with an adequate chapter on the development and histogenesis of the nervous system. The final chapter is concerned with a brief description of the histopathology of the nervous system.—*Lt. (jg) P. K. Hamilton, Jr. (MC) U. S. N.*

OFFICE IMMUNOLOGY INCLUDING ALLERGY, A Guide for the Practitioner, edited by Marion B. Sulzberger and Rudolf L. Baer. Contributing authors: Marion B. Sulzberger, M. D., *Professor of Clinical Dermatology and Syphilology and Director, New York*

Skin and Cancer Unit, New York Post-Graduate Medical School and Hospital; W. C. Spain, M. D., Clinical Professor of Medicine, New York Post-Graduate Medical School and Hospital; Rudolf L. Baer, M. D., Instructor in Dermatology and Syphilology, New York Skin and Cancer Unit, New York Post-Graduate Medical School and Hospital; Abraham Kanof, M. D., Adjunct Pediatrician, Jewish Hospital, Brooklyn; Alfred J. Well, M. D. Lederle Laboratories Division, American Cyanamid Company; and Naomi M. Kanof, M. D., Associate Attending in Dermatology, Garfield Memorial and Children's Hospitals, Washington, D. C. 420 pages; illustrated. The Year Book Publishers, Inc., Chicago, Illinois, publishers, 1947. Price \$6.50.

As is true of the other general practice manuals, this one also is practical and fills a very real need. The minutiae of immunologic testing is not only described by the written word but profusely illustrated with photographs. Only those immunologic methods are described which the physician can perform in his office in the fields of allergy, of immunization against infectious diseases, and so forth. The common technics of prophylactic and therapeutic procedures are adequately covered. The authors in the section on the immunology of infections cover 33 systemic diseases, from botulism to yellow fever, where immunologic methods are of value in prophylaxis, diagnosis and/or treatment. This same procedure is employed in the section on dermatologic immunology covering 27 diseases.

Short chapters are devoted to transfusion reactions, the Rh factor, respiratory allergies, miscellaneous allergies, and the immunologic management of spider, insect, and snake bites.

The manual contains 27 tables which are useful as a quick ready-reference source of information. As an example, table 21 contains a list of over 810 substances with the concentrations and vehicles to be used in patch testing. The reviewer would have found this table alone most welcome during the recent war years when engaged in industrial medicine. The manual also serves as a source of ready reference to the useful immunologic preparations, full names of supplying firms, packaging information, dosage schedule, and so forth.

This book is highly recommended to all medical officers interested in immunology, dermatology, or allergy.—*Commander M. T. Yates (MC) U. S. N.*

A PRACTICAL TEXTBOOK OF LEPROSY by R. G. Cochrane, M. D., Ch. B. (Glas), F. R. C. P. (Lond), D. T. M. & H. (Eng.) *Medical Secretary, Mission to Lepers, Principal, Missionary Medical College, Vellore, 8, India, Hon. Director, Leprosy Campaign and Hon. Director, Leprosy Research, Madras Presidency, Hon. Physician in Charge of Leprosy Departments General and Stanley Hospitals, Madras, Lately Chief Medical Officer Lady Willingdon Leprosy Sanatorium, Ohingleput, S. India*, with foreword by George R. McRoberts, C. I. E., M. D., F. R. C. P., DTM&H, Lt. Col., I. M. S. 283 pages, illustrated. Oxford University Press, London, publishers, 1947. Price \$11.50.

This author has presented a textbook of information on the leprosy problem based on many years of study, research and observation of cases in one of the most heavily endemic areas of leprosy within the world today. Presented in an authoritative manner, the book covers the epidemiology, pathology, clinical picture, diagnosis, treatment, and prevention of leprosy. After over 20 years of personal experience in the diagnosis and care of leprosy in highly endemic areas including 10 years in the Madras Presidency, India, the author has had more practical experience than almost any other living physician.

An entirely optimistic approach is stressed on the prognosis of leprosy. The author points out the great misunderstanding of both lay and medical public on the prognosis and infectiousness of this disease. Emphasis is placed upon the fact that cures occur spontaneously in many, many live long useful lives, and only a small percentage become completely disabled.

The author accepts *Mycobacterium leprae* rather emphatically as the etiologic agent despite the universal failure to culture and reproduce the disease with this organism.

The elimination of childhood contact with lepers of the "open" type is considered to be the greatest epidemiologic problem in the control of this disease. The epidemic of leprosy in England which reached its height from 1000 A. D. to 1400 A. D. is pointed out as evidence of the influence brought about by the control of childhood leprosy. Many similar studies of villages in India point out the same fact. Aside from this childhood contact the only factor influential in the spread of leprosy in the race of the group. It is stated that the Mongolian and European races are much more susceptible than the African and Indian races.

The pathology of leprosy is important in understanding the variety of types, the meaning of "open" and "closed" cases, and the reasons for cure and relapse. Although the author admits entrance into a controversial subject in this field, he takes a firm stand in his belief that the bacilli are disseminated through the body by macrophages which then die and liberate the organisms in their new site. His concept makes the attack of leprosy an attack focused on the therapy of the lesions in the skin first, foremost, and always.

Although the section dealing with the clinical diagnostic laboratory procedures is lacking in up-to-date factual information, the author explains this in his bibliography by a lack of access to some of the literature. This minor deficiency is more than compensated by a wealth of material gleaned from years of diligent study of cases.

The use of lepromin is emphasized; its interpretation, preparation, and administration is adequately described. It has considerable prognostic value.

The classification and reasons for such classification are clearly portrayed.

Special types of leprosy are carefully discussed from the standpoint of prevention, diagnosis, and therapy.

The over-all therapeutic problem is treated by the break-down into the methods of handling the various types of leprosy. In this respect it is emphasized that surgical excision of the hypopigmented areas for removal of the bacilli in the skin is the most effective therapeutic measure.

Although chaulmoogra oil is used by the author he emphasizes that its most effective site is into the local skin lesion by multiple injection. His enthusiasm for this drug or any other drug in use today is limited.

The need for a belief in divine guidance and prayer is stressed when one is dealing with the problem of late lepromatous leprosy.

The book presents an interesting and seemingly factual picture of the great problem of leprosy. It leaves one with a feeling of hope, courage, and deeper understanding of the leper problem.—*Lt. L. W. Fix (MC) U. S. N.*

SURGERY OF THE HAND, by R. M. Handfield-Jones, M. C., M. S., F. R. C. S., *Surgeon to St. Mary's Hospital; Senior Surgeon, Florence Nightingale Hospital; Consulting General Surgeon, Hospital for Women, Soho Square; Lecturer in Operative Surgery, St. Mary's Hospital Medical School; Late Hunterian Professor, R. C. S.; Examiner in Surgery, Universities of Cambridge, London and Liverpool and the Society of Apothecaries.* 2d edition. 164 pages, 104 illustrations including several in color. The Williams & Wilkins Co., Baltimore, Md., publishers, 1946. Price \$5.50.

This book would be better titled "Infections and Injuries of the Hand" as it deals primarily with these subjects and only secondarily with reconstructive surgery of the hand which is an extremely important part of Surgery of the Hand.

The discussion of injuries and infections of the hand and minor surgery is extensive but many statements need be modified, it is believed, in light of recent knowledge of the effects of antibiotics.

There are many illustrations including photographs, drawings, and charts but many are repeated throughout the book.

This text cannot be compared with such books as "Surgery of the Hand" by Sterling Bunnell.—*Commander J. S. Thieme (MC) U. S. N.*

THE SURGERY OF THE COLON AND RECTUM, by Sir Hugh Devine, M. S. (Melb.), Hon. F. R. C. S. (Eng.), F. R. A. C. S., F. A. C. S., *formerly Senior Surgeon St. Vincent's Hospital Clinical School, Melbourne, and other Stewart Lecturer in Surgery, Melbourne University; Past President Australasian College of Surgeons; Hon. Fellow of the Association of Surgeons of Great Britain and Ireland; Hon. Fellow, Royal Society of Medicine; Chairman, Editorial Committee of the Australasian and New Zealand Journal of Surgery; and John Devine, M. S. (Melb.), F. R. C. S. (Eng.), F. R. A. C. S., F. A. C. S., Honorary Surgeon to Out-Patients Alfred Hospital, Melbourne.* 362 pages, 277 illustrations. The Williams & Wilkins Co., Baltimore, Md., publishers, 1948. Price \$12.50.

The theme which runs through the book is diagnostic and operative—to improve the results of surgery in malignant disease of the colon and rectum. The book is offered to the junior surgeon who is feeling his way in surgery of the colon and rectum; to the senior surgeon that he may compare it with his own experiences in this branch of surgery, and to the student who goes further than his textbook in search of wider knowledge.

The book is divided into 22 well-organized chapters, whose principal theme is the welfare of the patient from early diagnosis of malignancies and the remedial approach to conservative surgery.

Minute orderly details have been instituted in the careful explanations of the more difficult operative procedures, at the same time stressing early diagnosis. Diagrammatic illustrations, for the most part, help the reader to clearly visualize the pathology and surgical procedures.

Of interest is the anatomical grouping in which the large bowel has been divided into innocent and malignant conditions for study.

The exploitation of the method of extraperitoneal operations and the chapters on "Operations on a defunctioned and prepared colon", are based on sound surgical judgment and the digestion of these chapters alone would pay dividends to all young surgeons. Chemotherapy is described as an adjunct to prepared defunctioned surgical procedures and not as a preparatory procedure to resections and primary anastomosis. There are, however, certain circumstances where the latter is more applicable.

The author emphasizes the spur and enterotome method for partial colectomy in ulcerative colitis. It is to be commended. The procedure we have used is the enterostomy with Koenig Rutzen bag and the later ileosigmoidostomy by suture anastomosis. The end result in either case has not proved too satisfactory.

Much is made of the author's operating frame. Mechanical devices of this nature are never as satisfactory as retractors in an assistant's hands. Retractors are more maneuverable and more gentle on the tissues.

The work is primarily the result of the author's own experiences. He is a veteran surgeon well qualified in the art of surgery and, through this his latest book, well qualified in the art of surgical literature. The book is highly recommended for young surgeons and would make a solid investment for any surgical library.—*Commander J. A. Murphy (MC) U. S. N.*

PRACTICAL MALARIOLOGY, Prepared Under the Auspices of the Division of Medical Sciences of the National Research Council, by Paul F. Russel, M. D., M. P. H., Colonel, M. C., A. U. S. *Parasitology Division, The Army Medical School, Field Staff, International Health Division, Rockefeller Foundation (on leave); Luther S. West, Ph. D., Head of Biology Department, Northern Michigan College of Education, Major, Sn. C., A. U. S. (Reserve); Formerly Entomologist, Parasitology Division, Army Medical School; and Reginald D. Manwell, Sc. D., Professor of Zoology, Syracuse University, New York, formerly Captain, Sn. C., A. U. S., Protozoology Section, Parasitology Division, Army Medical School.* Foreword by Raymond B. Fosdick, *President of the Rockefeller Foundation.* 684 pages, with 238 illustrations, 8 in color. W. B. Saunders Co., Philadelphia, Pa., publishers, 1946. Price \$8.

This valuable manual includes in one volume much valuable practical clinical, laboratory, and field information regarding malaria. The material is presented as a succinct narrative account of the basic elements of malariology. Included are many important new developments which have arisen during World War II.

The subject matter is introduced with a brief but interesting historical account of the development of our knowledge of malaria. The body of the text is divided into 6 major sections of 29 chapters, dealing with: the malarial parasite; the mosquito; man; community; prophylaxis and control; and therapeutic malaria. Although the text is not encyclopedic in nature, it covers the subject quite thoroughly and each chapter has an excellent bibliography. The authors have drawn not only upon the extensive experience of the International Health Division of the Rockefeller Foundation, but also upon every other available official and non-official source of information, including the rich experience of the armed services. Several phases of the subjects discussed are particularly enriched by the wealth of first-hand information gathered through many years of experience in malariology by the senior author. This book also includes a splendid 71-page key to the anophelines of the world, which was carefully compiled and edited by experts in the field of mosquito taxonomy. The authors point out that, although the science of malariology is notably advanced, it is well to keep in mind certain phases which offer research problems of great interest.

The style in which the material is presented is accurate yet simple and readily understandable by the layman as well as by the professionally trained man. This book should be in the library of every physician, scientist, and Public Health officer stationed in malarious areas of the world.

S. A. Edgar, S. A. Scientist (R), U. S. P. H. S.

BOOKS RECEIVED

Receipt of the following books is acknowledged. As far as practicable, these will be reviewed at a later date.

QUANTITATIVE PHARMACEUTICAL CHEMISTRY, by Glenn L. Jenkins, Ph. D., *Professor of Pharmaceutical Chemistry and Dean of the School of Pharmacy, Purdue University*; Andrew G. DeMez, Ph. D., *Professor of Pharmacy and Dean of the School of Pharmacy, University of Maryland*; John E. Christian, Ph. D., *Associate Professor of Pharmaceutical Chemistry, School of Pharmacy, Purdue University*; and George P. Hager, Ph. D., *Associate Professor of Pharmaceutical Chemistry, School of Pharmacy, University of Maryland*. 3d edition. 531 pages. McGraw-Hill Book Co., Inc., New York, N. Y., publishers, 1949. Price \$4.75.

THE PHARMACOLOGIC PRINCIPLES OF MEDICAL PRACTICE, A textbook on Pharmacology and Therapeutics for Medical Students, Physicians, and the Members of the Professions Allied to Medicine, by John C. Krantz, Jr., and C. Jelleff Carr. 980 pages. The Williams & Wilkins Co., Baltimore, Md., publishers, 1949. Price \$10.

PAIN SYNDROMES, Treatment by Paravertebral Nerve Block, by Bernard Judovich, B. S., M. D., *Instructor in Neurology, Graduate School of Medicine, University of Pennsylvania*; *Physician in Charge, Neuralgia Clinic, Graduate Hospital, Philadelphia, Pa.*; and William Bates, B. S., M. D., F. A. C. S., F. I. C. S., *Professor of Surgery, Graduate School of Medicine, University of Pennsylvania*; *Consulting Surgeon, Rabies' Hospital and Philadelphia Home for Incurables*; *Consulting General Surgeon, Wills Hospital, Philadelphia, Pa.* Foreword by Joseph C. Yaskin, M. D., *Professor of Neurology, Graduate School of Medicine, University of Pennsylvania, Philadelphia, Pa.* 3d edition. 357 pages, 181 illustrations. F. A. Davis Co., Philadelphia, Pa., publishers, 1949. Price \$6.

CLINICAL ORTHOPTICS, Diagnosis and Treatment, by Mary Everist Kramer, *Supervisor, The Orthoptic Department, The George Washington University Hospital, Washington, D. C.* Edited by Ernest A. W. Sheppard, M. D., *Professor of Ophthalmology,*

- The George Washington University School of Medicine, Washington, D. C., and Louisa Wells-Kramer, Certified Orthoptic Technician, Washington, D. C., 475 pages, 147 illustrations. The C. V. Mosby Co., St. Louis, Mo., publishers, 1949. Price \$8.*
- MUSCLES TESTING AND FUNCTIONING**, by Henry O. Kendall and Florence P. Kendall *Physical Therapy Department, Children's Hospital School, Baltimore, Md.* The Williams & Wilkins Co., Baltimore, Md., publishers, 1949. Price \$7.50.
- THE 1948 YEAR BOOK OF UROLOGY**, edited by Oswald S. Lowsley, M. D., F. A. C. S., *Director, James Buchanan Brady Foundation, New York Hospital; Visiting Urologist, Saint Clare's Hospital; Consulting Urologist, Hospital for Ruptured and Crippled Peckskill Hospital, etc.; Member, International Urological Association, Pan-American Medical Association, Pan-American Medical Confederation, International College of Surgeons; Officer of the National Order of Merit and Honor of Haiti.* 445 pages. The Year Book Publishers, Inc., Chicago, Ill., publishers 1948. Price \$4.75.
- TEXTBOOK OF HISTOLOGY**, by Jose F. Nonidez, D. Sc., *Late Professor of Anatomy, Cornell University and Professor of Microscopic Anatomy, University of Georgia* and William F. Windle, Ph. D., Sc. D., *Professor of Anatomy, University of Pennsylvania.* 456 pages, 287 illustrations, composed of 209 drawings and diagrams and 193 photomicrographs. McGraw-Hill Book Co., Inc., New York, N. Y., publishers, 1949. Price \$6.75.
- ATLAS OF PERIPHERAL NERVE INJURIES**, by William R. Lyons, Ph. D., *Associate Professor of Anatomy, University of California Medical School*, and Barnes Woodhall, M. D., *Professor of Neurosurgery, Duke Medical School, Durham, N. C.* W. B. Saunders Co., Philadelphia, Pa., publishers, 1949. Price \$16.
- MODERN TRENDS IN PUBLIC HEALTH**, edited by Arthur Massey, C. B. E., M. D., D. P. H., D. P. A. Paul B. Hoeber, Inc., New York, N. Y., publishers, 1949. Price \$12.50.
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UNITED STATES NAVAL MEDICAL BULLETIN

THE MISSION OF THE MEDICAL DEPARTMENT OF THE NAVY
TO KEEP AS MANY MEN AT AS MANY GUNS
AS MANY DAYS AS POSSIBLE



BIMONTHLY

DIVISION OF PUBLICATIONS
BUREAU OF MEDICINE AND SURGERY
JOSEPH L. SCHWARTZ, Captain (MC), U. S. N., Editor

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NAVY DEPARTMENT,
Washington, March 20, 1907.

THIS UNITED STATES NAVAL MEDICAL BULLETIN is published by direction of the Department for the timely information of the Medical and Hospital Corps of the Navy.

TRUMAN H. NEWBERRY,
Acting Secretary.



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PREFACE



The UNITED STATES NAVAL MEDICAL BULLETIN was first issued in April 1907 as a means for supplying Medical Department personnel of the United States Navy with information regarding the advances which are continually being made in the medical sciences, and as a medium for the publication of accounts of special researches, observations, or experiences of individual medical officers.

With the establishment of the Nurse Corps in 1908, the Dental Corps in 1912, and the Medical Service Corps in 1947, the function of the BULLETIN was broadened to serve in a similar capacity for members of those Corps.

It is the aim of the Bureau of Medicine and Surgery to furnish in each issue special articles relating to naval medicine and dentistry, editorial comment on current literature of special professional interest to Medical Department personnel, clinical notes on interesting cases, descriptions of suggested devices, reports from various sources, notes and comments on topics of professional interest, and notices of newly published professional books.

The Bureau extends an invitation to all officers of the Medical Department to prepare and forward, with a view to publication, contributions on subjects of professional interest.

The Bureau does not necessarily undertake to endorse views or opinions which may be expressed in the pages of this publication.

CLIFFORD A. SWANSON,
Surgeon General, United States Navy.

III

NOTICE TO CONTRIBUTORS



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JOSEPH L. SCHWARTZ, *Editor,*
Captain, Medical Corps,
United States Navy.

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LAST ISSUE
OF THE
U. S. NAVAL MEDICAL
BULLETIN

This is the last issue of the "United States Naval Medical Bulletin," published continuously since 1907.

In January 1950, a new publication, the "United States Armed Forces Medical Journal," will appear in its place. This periodical is the result of unification of the "Bulletin of the U. S. Army Medical Department" and the "U. S. Naval Medical Bulletin," and will be published monthly to serve the medical personnel of the Army, Navy, and Air Force.

ADDRESS YOUR REPLY TO
BUREAU OF MEDICINE AND SURGERY
NAVY DEPARTMENT, WASHINGTON 25, D. C.
AND REFER TO



21 November 1949



WASHINGTON 25, D. C.

Fellow Officers of the Medical Department:

Aviation medicine is concerned with many problems among which are the maintenance of the physical and psychologic well being of aviation personnel under conditions of great physical stress and the selection of pilots and air crewmen who will be able to withstand severe and unusual physical and psychologic strain and stress.

Environmental conditions during flight in modern high speed, high altitude aircraft is ever approaching and in some instances even exceeding human physiologic tolerance. Low atmospheric pressures, low oxygen tensions, high accelerations, and the necessity for integrating the readings of many complex instruments, readily evokes pilot fatigue and a resultant temporary or even permanent physical or psychological impairment. The prevention of such disabilities requires improved methods for the selection of pilots in order to eliminate the less fit and also requires methods whereby early abnormal reactions to stress may be detected. The reduction and elimination, where possible, of causative factors is essential. To achieve this requires the close cooperation of the aviation medical officer with the aircraft designer, the engineer, and the pilot. Equipment such as antiblackout suits, oxygen regulators and masks, restraining harnesses and seats, and ejection seats has been devised. The improvement of aircraft equipment and instruments requires research in psychology and physiology and in particular, research in the physiology of the nonauditory labyrinth and the cardiovascular-respiratory system. Of urgent necessity is the solution of the problems of emergency escape from supersonic high altitude aircraft.

The increasing importance of the human factor in both civilian and military aviation has brought many new problems for which solutions must be found and medical officers will find a real opportunity for service and accomplishment in this almost unlimited field of medicine. Aviation medicine offers a well-rounded professional career with special opportunities for assignments in research in the basic sciences and in the applied fields of aviation medicine, or in the clinical specialties such as ophthalmology, otolaryngology, psychiatry, and surgery.

Sincerely,

A handwritten signature in cursive script, likely of a Rear Admiral in the Medical Corps.

Rear Admiral, Medical Corps
Surgeon General, U. S. Navy

U. S. NAVAL MEDICAL BULLETIN

VOL. 49

NOVEMBER-DECEMBER 1949

No. 6

ARTICLES



Cardiolipin-Slide and Standard Kahn Tests for Syphilis¹

A Comparative Study

WILLIAM SILLIPHANT, *Captain (MC) U. S. N.*

JOHN J. ENGELFRIED, *Commander (MSC) U. S. N.*

GEORGE S. ELLIS, *Lieutenant, junior grade (MC) U. S. N.*

BARBARA BUTTERFIELD, *Lieutenant, junior grade (MSC) U. S. N.*

THE isolation of cardiolipin and purification of lecithin by Pangborn (1) (2) (3) (4) (5) led to the anticipation that cardiolipin antigen, in tests for syphilis, would give superior results to those given by the "older" antigens and some, indeed, believed that with this highly purified antigen false positive reactions need no longer be considered of serious consequence. These beliefs led to extensive studies of cardiolipin antigen by different workers. Soon, the results of serologic tests performed with cardiolipin antigen began to appear in the literature. Among these might be mentioned the Kolmer complement fixation test with cardiolipin antigen by Harris and Portnoy (6), the Rein and Bossack (7), Kline (8), and VDRL (Venereal Disease Research Laboratory) (9) slide tests and the Brown (10) and Kahn (11) (12) (13) (14) (15) tube precipitation tests. The results given by tests with cardiolipin antigen compared

¹ From the department of serology, U. S. Naval Medical School, and the department of dermatology, U. S. Naval Hospital, National Naval Medical Center, Bethesda, Md.

with those given by tests with the older antigens have not as yet established the status of the new antigen in the serology of syphilis. The aim of this study was to determine the value of a cardiolipin slide test with two different cardiolipin antigens in relation to the standard Kahn test.

The determination of the value of cardiolipin antigen is of particular importance to the United States Navy in which the Kahn is the standard test for syphilis and has served in this capacity since 1925. The Kahn test has shown a consistent record of extraordinary high specificity in serologic evaluation studies since 1928. Therefore, any new method which the Navy might adopt as a standard must first of all show a similar record of high specificity. The same method must also demonstrate a sensitivity at least equal to the standard Kahn and be sufficiently practicable to give consistently reliable results in the hands of different workers.

In 1947 the serology department of the Naval Medical School began studies of the Venereal Disease Research Laboratory's slide test, employing cardiolipin antigens from two different sources. This slide test with the two antigens was compared with the standard Kahn test. The most practical approach to this problem appeared to be the performance of triplicate tests on routine specimens with careful evaluation of the clinical findings.

Actually, additional serologic tests were also performed whenever serum was available using, in addition to the three tests mentioned, the Kolmer, Mazzini, presumptive Kahn, and the cardiolipin Kahn tests. However, in view of the fact that the major problem was a comparison of the cardiolipin slide test with the standard Kahn, this report will be limited to the results obtained with these two tests. It is planned that a later report will include the results given by all the tests employed.

METHOD OF STUDY

This study is based on the examination of more than 24,000 specimens. The sera after overnight refrigeration were heated at 56° C. for 30 minutes and tested as follows. The presumptive Kahn test was carried out a few minutes after inactivation of the serum. While the results of this test were being read, the cardiolipin-slide tests were set up with both antigens. These 3 tests were performed on all specimens examined. When the presumptive Kahn and the cardiolipin-slide tests gave negative results no other test was performed unless the complete performance of the several tests employed was requested. When the presumptive Kahn and slide tests were doubtful or positive the standard Kahn, the cardiolipin Kahn, and Mazzini tests were performed. These tests were completed within 2 hours after the heating

of the sera. All tests were read by 2 workers. When a quantitative Kahn was indicated, the serum was reheated at 56° C. for 10 minutes. It was also necessary to reheat the serum for the Kolmer tests which were started in the late afternoon and completed the following morning.

RESULTS

As indicated, 24,816 sera were examined with the presumptive Kahn and the two cardiolipin-slide tests. All three tests gave negative reactions with 23,576 specimens; of the remaining 1,240 specimens, one or more tests gave either positive or doubtful reactions. These 1,240 specimens were obtained from 598 individuals. The results obtained are presented in the accompanying tables.

Table 1 presents the comparative Kahn and cardiolipin-slide results in early primary syphilis. The cases were divided into 3 groups. There were 77 cases of untreated early syphilis confirmed by positive dark-field examinations for *Treponema pallidum* as well as other clinical evidence. Twenty-two of these cases gave negative results with all antigens and are not included in this table. In the other 55 cases, 1 or more of the serologic reactions were positive. In these cases the standard Kahn test gave 84 percent of positive reactions; cardiolipin-slide A, 71 percent; and cardiolipin-slide B, 69 percent of positive reactions. With regard to doubtful reactions, the standard Kahn gave 2 percent; cardiolipin-slide A, 5 percent; and cardiolipin-slide B, 13 percent.

TABLE 1.—Results with standard Kahn and cardiolipin-slide tests in primary syphilis

Tests	Cases with positive reactions		Cases with doubtful reactions (no positive reactions)		Cases with only negative reactions	
	Number	Percent	Number	Percent	Number	Percent
Early primary, untreated—55 cases:						
Standard Kahn.....	46	83.6	1	1.8	8	14.5
Cardiolipin-slide A.....	39	70.9	3	5.4	13	23.6
Cardiolipin-slide B.....	37	68.5	7	13.0	10	18.5
Early primary, recently treated ¹ —33 cases:						
Standard Kahn.....	24	72.7	6	18.2	3	9.1
Cardiolipin-slide A.....	20	60.6	3	9.1	10	30.3
Cardiolipin-slide B.....	19	59.4	2	6.2	11	34.4
Early primary, treated ² —25 cases:						
Standard Kahn.....	18	72.0	1	4.0	6	24.0
Cardiolipin-slide A.....	18	72.0	3	12.0	4	16.0
Cardiolipin-slide B.....	18	75.0	2	8.3	4	16.6

¹ Previous treatment administered less than 6 months prior to this study.

² Previous treatment administered more than 6 months prior to this study.

The second group, 33 cases, were those first treated within 6 months prior to these serologic examinations. The standard Kahn gave 73

percent of positive reactions; cardiolipin-slide A, 61 percent; and slide B, 59 percent. In this group the standard Kahn gave 18 percent doubtful reactions and the cardiolipin-slide tests, 9 and 6 percent, A and B respectively.

The third group, 25 cases, comprised those in which treatment had been instituted more than 6 months prior to this study. The standard Kahn and cardiolipin-slide A gave each 72 percent positive reactions; the cardiolipin-slide B gave 75 percent of positive reactions. The percentage of doubtful reactions in this group was as follows: standard Kahn, 4 percent; cardiolipin-slide A, 12 percent; and cardiolipin-slide B, 8 percent.

In summarizing the results of the standard Kahn and cardiolipin-slide tests in early syphilis, untreated and treated, the table shows that in a total of 113 cases of primary syphilis, in which one or more reactions were positive, the standard Kahn gave positive reactions in 88 cases and doubtful reactions in 8; cardiolipin-slide A gave positive reactions in 77 cases and doubtful reactions in 9; and cardiolipin-slide B gave positive reactions in 74 cases and doubtful reactions in 11.

In addition to the serologic studies of primary syphilis, an opportunity was afforded us to determine also comparative Kahn and cardiolipin-slide reactions in latent syphilis, both untreated and treated. Table 2 summarizes the results obtained. It is noted that of 19 cases of untreated latent syphilis the standard Kahn gave 95 percent positive reactions; the cardiolipin-slide A, 84 percent; and cardiolipin-slide B, 83 percent positive reactions.

TABLE 2.—*Results with standard Kahn and cardiolipin-slide tests in latent syphilis*

Tests	Cases with positive reactions		Cases with doubtful reactions (no positive reactions)		Cases with only negative reactions	
	Number	Percent	Number	Percent	Number	Percent
Latent syphilis, untreated—19 cases:						
Standard Kahn.....	18	94.7	0	-----	1	5.3
Cardiolipin-slide A.....	16	84.2	0	-----	3	15.8
Cardiolipin-slide B.....	15	83.3	0	-----	3	16.7
Latent syphilis, recently treated ¹ —33 cases:						
Standard Kahn.....	25	75.8	3	9.1	5	15.2
Cardiolipin-slide A.....	22	68.8	3	9.4	7	21.9
Cardiolipin-slide B.....	19	61.3	5	16.1	7	22.6
Latent syphilis, treated ² —59 cases:						
Standard Kahn.....	37	63.8	7	12.1	14	24.1
Cardiolipin-slide A.....	34	57.6	12	20.3	13	22.0
Cardiolipin-slide B.....	35	59.3	11	18.6	13	22.0

¹ Previous treatment administered less than 6 months prior to this study.

² Previous treatment administered more than 6 months prior to this study.

Thirty-three cases of recently treated latent syphilis were also studied. These had received treatment within the 6 months prior to this series of serologic tests. The standard Kahn gave 76 percent positive and 9 percent doubtful reactions. The cardiolipin-slide A gave 69

percent positive and 9 percent doubtful reactions, and the cardiolipin-slide B gave 61 percent positive and 16 percent doubtful reactions.

Fifty-nine cases of latent syphilis, which had received treatment at some time prior to the 6 months before this series of serologic tests, gave, with the standard Kahn, 64 percent positive and 12 percent doubtful reactions; with the cardiolipin-slide A, 58 percent positive and 20 percent doubtful; and with cardiolipin-slide B, 59 percent positive and 19 percent doubtful reactions.

It is thus evident from table 2 that, as is true in the case of early syphilis, whether treated or not treated, the standard Kahn is, as a whole, more sensitive than either of the two cardiolipin-slide methods. Another significant fact is that the two cardiolipin-slide methods showed differences in sensitivity.

TABLE 3.—Results with standard Kahn and cardiolipin-slide tests in central nervous system syphilis

Tests	Cases with positive reactions		Cases with doubtful reactions (no positive reactions)		Cases with only negative reactions	
	Number	Percent	Number	Percent	Number	Percent
C. N. S. ¹ syphilis, untreated—6 cases:						
Standard Kahn.....	4	66.7	1	16.7	1	16.7
Cardiolipin-slide A.....	6	100.0	0		0	
Cardiolipin-slide B.....	6	100.0	0		0	
C. N. S. ¹ syphilis, recently treated ² —8 cases:						
Standard Kahn.....	8	100.0	0		0	
Cardiolipin-slide A.....	8	100.0	0		0	
Cardiolipin-slide B.....	8	100.0	0		0	
C. N. S. ¹ syphilis, treated ³ —10 cases:						
Standard Kahn.....	7	70.0	0		3	30.0
Cardiolipin-slide A.....	6	60.0	2	20.0	2	20.0
Cardiolipin-slide B.....	5	50.0	2	20.0	3	30.0

¹ Central nervous system.

² Previous treatment administered less than 6 months prior to this study.

³ Previous treatment administered more than 6 months prior to this study.

Table 3 presents comparative results in central nervous system syphilis. The data are limited to a total of 24 cases. The standard Kahn gave positive reactions in 79 percent and doubtful reactions in 4 percent; the cardiolipin-slide A gave 83 percent positive and 8 percent doubtful; the cardiolipin-slide B gave 79 percent positive and 8 percent doubtful reactions. In this small series, the comparative results are closely comparable.

TABLE 4.—Results with standard Kahn and cardiolipin-slide tests in congenital syphilis

Tests	Positive		Doubtful		Negative	
	Number	Percent	Number	Percent	Number	Percent
Congenital syphilis, untreated—4 cases:						
Standard Kahn.....	2	50.0	0		2	50.0
Cardiolipin-slide A.....	2	50.0	1	25.0	1	25.0
Cardiolipin-slide B.....	3	75.0	1	25.0	0	

The results in four cases of congenital syphilis, all of which were untreated, are illustrated in table 4.

The next series of studies, table 5, deals with false positive reactions in a group of cases in which syphilis has been definitely excluded. Many of the individuals of this group gave a history of recent immunization, the majority of which were multiple, including cowpox, typhoid, tetanus, and others required by personnel in the naval service. Of 93 cases (representing 0.37 percent of all cases) giving false positive reactions, the standard Kahn gave positive reactions in 50 percent of the cases and doubtful reactions in 32 percent. The cardiolipin-slide A gave 37 percent positive and 15 percent doubtful reactions, and the cardiolipin-slide B gave 38 percent positive and 14 percent doubtful reactions. Analysis of results of these 93 cases show that the cardiolipin antigen gave fewer false positive reactions than the Kahn antigen, thus indicating a lesser degree of specificity for the latter.

TABLE 5.—*Results with standard Kahn and cardiolipin-slide tests in false positive cases*

Tests	Positive		Doubtful		Negative	
	Number	Percent	Number	Percent	Number	Percent
False positives—93 cases: ¹						
Standard Kahn.....	47	50.5	30	32.2	16	17.2
Cardiolipin-slide A.....	34	37.4	14	15.4	43	47.2
Cardiolipin-slide B.....	35	38.0	13	14.1	44	47.8

¹ This group of cases is based on a total of 24,816 routine examinations.

In table 6 are summarized the results of 253 cases which were impossible to classify because of incomplete histories. Many of these were civilians seeking employment at various naval activities; others were individuals whose sera were sent in from outlying naval stations. In neither of these groups was accurate histories obtainable. The table shows that in these cases of undetermined diagnoses, the Kahn test gave 55 percent positive reactions, while each cardiolipin-slide test gave 52 percent.

TABLE 6.—*Results with standard Kahn and cardiolipin-slide tests in cases with incomplete histories*

Tests	Positive		Doubtful		Negative	
	Number	Percent	Number	Percent	Number	Percent
Undetermined diagnosis—253 cases:						
Standard Kahn.....	140	55.3	42	16.6	71	28.1
Cardiolipin-slide A.....	129	51.6	43	17.2	78	31.2
Cardiolipin-slide B.....	128	51.6	44	17.7	76	30.6

These results suggest a greater degree of sensitivity for the Kahn test. While the diagnosis was not made, the indications were that the majority of these cases actually had syphilis, since 88 percent of the sera were positive with two or more antigens and 16 percent with all the antigens. It is realized that certain of these positive reactions, in all probability, represent false positives as diagnoses other than syphilis were submitted in some of these cases.

Table 7 presents a general summary of the percentage of positive reactions obtained in all cases of syphilis, both untreated and treated. In untreated syphilis, the standard Kahn gave positive reactions in 83 percent of cases, the cardiolipin-slide A in 75 percent, and the cardiolipin-slide B in 74 percent. In the treated cases the standard Kahn gave 71 percent positive reactions; the cardiolipin-slide A, 65 percent; and the cardiolipin-slide B, 63 percent positive reactions.

TABLE 7.—*Summary of results with standard Kahn and cardiolipin-slide tests in untreated and treated syphilis*

Tests performed	Percentage of positive cases					
	Untreated syphilis ¹			Treated syphilis ²		
	Positive	Doubtful	Negative	Positive	Doubtful	Negative
Standard Kahn.....	83.3	2.4	14.3	71.2	10.2	18.6
Cardiolipin-slide A.....	75.0	4.8	20.2	64.7	13.8	21.6
Cardiolipin-slide B.....	74.4	9.8	15.8	63.4	13.4	23.2

¹ Untreated, 84 cases with 1 or more positive reactions, including early, latent, central nervous system, and congenital syphilis.

² Treated, 167 cases with 1 or more positive reactions including early, latent, and central nervous system syphilis.

THE SPECIFICITY OF THE KAHN REACTION BASED ON OFFICIAL NATIONAL EVALUATION STUDIES, 1937-49

In judging the specificity of any serologic test for syphilis, evaluation studies undoubtedly represent a highly important criterion. In such studies, each serologist is given a number of "unknown" specimens for examination with his particular method and he reports his results based on that method. The existence or lack of existence of syphilis is determined by an official evaluation committee. The first evaluation studies on tests for syphilis were carried out by the League of Nations Health Organization and later also by the American Evaluation Committee, under the auspices of the U. S. Public Health Service and the American Society of Clinical Pathologists.

Table 8 shows the specificity of the Kahn test given in the official evaluation studies in which that test has participated since 1937 (16) (17). It is noted from table 8 that of a total of 2,583 non-syphilitic cases examined, the Kahn test did not give a single positive or doubtful reaction in the nonsyphilitic cases.

TABLE 8.—*Specificity of standard Kahn tests in official national evaluation studies from 1937-49*¹

Year	Number of nonsyphilitic donors	Specificity (percent)
1937.....	100	100
1938 ²	96	100
1938 ²	444	100
1939.....	114	100
1940.....	111	100
1941 ²	130	100
1941 ²	453	100
1942.....	129	100
1943.....	131	100
1944.....	161	100
1945.....	153	100
1946.....	135	100
1947.....	136	100
1948.....	141	100
1949.....	149	100

¹ In the examination of 2,583 nonsyphilitic donors.² In 1938 and again in 1941, 2 separate studies were undertaken.

COMPARISON OF THE SPECIFICITY OF THE CARDIOLIPIN-SLIDE TEST AND THE KAHN TEST BASED ON THE OFFICIAL NATIONAL EVALUATION STUDIES

The opportunity to examine the specificity of slide tests with cardiolipin antigen in other laboratories was afforded us by the recent release of the results of the 1949 National Serologic Evaluation Survey (17). According to these evaluation findings, 21 State health department laboratories reported their results on the Venereal Disease Research Laboratory slide tests. Of these laboratories, 7 gave 100 percent specificity and 14 gave false positive or false doubtful reactions.

The same evaluation report also gives the results of 29 State health department laboratories which reported Kahn results. Of these laboratories, 17 gave 100 percent specificity and 12 gave false positive or false doubtful reactions. The results are summarized in table 9.

TABLE 9.—*Standard Kahn and V. D. R. L.¹ slide tests in 1949 official national evaluation study*

Test	Number of State health department laboratories performing tests	Number giving 100 percent specificity	Number giving false reactions	Number giving more than 1 percent false reactions
V. D. R. L. ¹	21	7	14	8
Standard Kahn.....	29	17	12	1

¹ Venereal Disease Research Laboratory.

Of special interest is the fact that this evaluation report shows that only one State laboratory reported a percentage of false positives greater than 1 with the Kahn test; namely, 1.5 percent. In the case

of State laboratories reporting cardiolipin-slide tests, however, eight laboratories reported percentages of false positives greater than 1; these ranged from 1.3 to 2.7 percent.

SUMMARY

Studies were carried out with the Venereal Disease Research Laboratory slide test, employing two antigens, compared with the standard Kahn test employing Kahn antigen. Of 598 cases studied, it was found that the standard Kahn test was more sensitive than the cardiolipin-slide tests with either of the two antigens employed. It was found also that these slide tests gave somewhat different results with these antigens on identical sera. Insofar as specificity is concerned, the cardiolipin-slide tests showed greater freedom from false positive reactions as compared with the standard Kahn tests, although data of evaluation studies on serologic tests for syphilis are somewhat at variance with these results.

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Coccidioidomycosis

Review of the Literature and Report of Nine Cases

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COCCIDIOIDOMYCOSIS is endemic in the southwestern part of the United States. It is of importance, not only to naval medical officers stationed in hospitals and dispensaries in the endemic area (southern California, Arizona, Utah, Nevada, New Mexico, and western Texas), but also to naval medical officers stationed elsewhere. Inactive infections with coccidioidomycosis immitis, incurred by active personnel who served in endemic areas during their military career, may become active in later years. Many of the manifestations of coccidioidomycosis will be recognized only by alertness to the possible presence of this disease.

ETIOLOGY AND EPIDEMIOLOGY

Coccidioidomycosis is caused by the fungus, *Coccidioides immitis*. The disease was originally described by R. Wernicke (1) in 1892 who also described the causative parasite. Wolbach (2) gave a detailed description of the morphological and cultural characteristics. Infection takes place by the entrance of the chlamydospores into the lung. Chlamydospores occur in the soil and are blown around and inhaled with particles of dust. Emmons (3) has shown that desert rodents are a reservoir of infection. The disease is prevalent during the dry months of July and August. Cattle and sheep become infected; in the laboratory, the disease can be transmitted to guinea pigs and mice. Coccidioidomycosis in a gorilla in the Zoo at San Diego has been reported by McKenny, Traum, and Bonestell (4).

Coccidioides immitis goes through a rather complicated life cycle. In man and animals the parasite exists in the form of the chlamydospores which, after entry into the body, mature into spherules and endospores. The spherules and endospores produce the granulomatous lesions which are characteristic of the disease. Outside the body the parasite exists in the form of spores and mycelia which in turn become converted into the infective chlamydospores.

It is thought that the infection is not transmitted from man to man, or from animal to animal. However, Rosenthal and Routien (5) have shown that coccidioidomycosis can be transmitted from man to experimental animals and from animal to animal by instilling sputum containing the infecting spherules into the bronchial tree. They believe that infection in man should be considered contagious.

Laboratory workers frequently become infected by inhalation of the chlamydospores. The disease has been reported from China, Mexico, Nicaragua, the Hawaiian Islands, and Italy. In South America a closely related organism *Pseudococcidioides mazzai* produces a similar disease.

Forbus' (6) excellent summary of the literature of coccidioidomycosis should be consulted for a more detailed review of the literature, the etiology, epidemiology, pathology, and clinical manifestations of the disease.

TYPES OF INFECTION

Primary coccidioidomycosis may manifest itself as a pulmonary infection which may be so mild as to escape detection or it may exist as a mild to severe type of pneumonitis, frequently associated with hilar node involvement and, at times, with pleuritis. The mild form of coccidioidomycosis (which simulates a mild attack of influenza) for years went unrecognized and was known locally as "San Joaquin fever," "desert fever," or "valley fever" (7). Gifford, in an unpublished observation in 1934, and Dickinson (8), in 1937, demonstrated the etiological relationship between "valley fever" and coccidioidomycosis and Gifford (9) subsequently showed the relationship between coccidioidal pulmonary infection and erythema nodosum.

The disseminated type of coccidioidomycosis occurs infrequently (in 1 out of 400 cases) and represents a much more severe manifestation of the disease, with a mortality of 50 percent. In the disseminated form of the disease the parasite breaks through the defense barriers around the primary site in the lung and by blood or lymphogenous spread may involve any part of the body. The most common sites for dissemination are the skin and subcutaneous tissues, lymph nodes, lungs, bones, meninges, joints, peritoneum, and the liver.

CLINICAL MANIFESTATIONS

In the primary form, the symptoms may be so mild as to escape detection as in the usual type of "valley fever."

In the moderately severe type there is a pneumonitis, which is usually associated with hilar node lymphadenopathy. The onset of the disease may be insidious or abrupt within 8 to 21 days after inhalation of the chlamydospore. There may be a temperature elevation from 101° to 103° F. with an increased respiratory and pulse

rate. There is usually a cough with mucopurulent sputum and frequently chest pain which may be pleuritic in character. Chills, malaise, anorexia, and mild pains in the joints, back, and abdomen may occur. In 5 percent of the cases there is an associated erythema nodosum or erythema multiforme. The clinical picture frequently simulates that of a virus pneumonia. After a week or 10 days, the fever abates, the chest pain and cough disappear, and the patient gets well. In some cases pneumonitis and continued elevation of temperature may persist for several weeks or longer, with an associated pleuritis with or without fluid. There may be headache, pharyngitis, and occasionally conjunctives, or hemoptysis. On physical examination, the chest findings are inconclusive and may resemble those found in any pneumonic infection. There may be cavitation and pleurisy with or without fluid.

The laboratory findings are inconclusive unless the organisms can be found in the sputum; these are difficult to find but may be cultured on Sabouraud's media. There is an increase in the sedimentation rate, a leukocytosis with a shift to the left, and occasionally an eosinophilia which is more apt to occur when erythema nodosum or erythema multiforme is present.

Roentgenograms of the chest may show a variety of findings. The usual picture is that of an area of pneumonitis associated with hilar lymph node involvement. As the pneumonitis subsides coarse fibrotic strands may be noted extending from the area involved to the hilar nodes. There may be focal lobar consolidation or miliary or nodular consolidation. The nodular areas may break down to form cavities, with a thick surrounding area of increased density resembling a doughnut. Small thin-walled cavities with little surrounding indurations may occur and persist for many months. There may be minimal or massive pleuritic infusion which on resolution leaves areas of thickened pleurae and there may be areas of encapsulated fluid. Occasionally there may be solid, dense, tumorlike areas of consolidation resembling areas of metastatic sarcoma. Previously existing infection may leave as a residue small areas of single or multiple areas of calcification. The various roentgenological manifestations are excellently shown in the Syllabus on Coccidioidomycosis, prepared for the Army Air Forces Western Flying Training Command, by Lee, Nixon, and Jamison (10), and in an article by Jamison (11).

DISSEMINATED COCCIDIOIDOMYCOSIS

In the disseminated form, which occurs in 1 in 400 to 1 in 500 cases (6) (12) (13), the clinical picture is quite different. Dissemination occurs much more frequently in the Negro race. Old fibrous pulmo-

nary lesions may persist for years and following an acute respiratory infection may break down and disseminate; or residual infection in a tracheal or hilar lymph node, many years following the primary pulmonary disease, may disseminate by rupturing into a bronchus or a pulmonary lymph or blood vessel (6). According to Forbus (6), dissemination may occur as late as 10 years after the primary infection although it usually follows within several months.

The diagnosis of disseminated coccidioidomycosis is difficult because of the close resemblance to other granulomatous infections, chiefly tuberculosis, blastomycosis, and actinomycosis. Outside of an endemic locality, the diagnosis is usually not made until the specific organisms are demonstrated in the exudate from the open lesion by cultural examination or by a histological preparation of excised tissue. In Forbus' (6) study of 95 cases of dissemination which occurred in the Army during World War II, the distribution of cases was as follows: lungs, 51 percent; skin and subcutaneous tissues, 46 percent; lymph nodes, 39 percent; bone, 29 percent; meninges, 10 percent; joints, 8 percent; peritoneum, 3 percent; and the liver, 1 percent.

The skin lesions which occur in the disseminated form of the disease will be discussed later.

The bone lesions are usually deep-seated, destructive, suppurating processes involving the medullary cavity or the cortex and overlying periosteum.

The meningeal manifestations frequently resemble those of a meningeal tumor, but, as in one of our cases, may also closely mimic tuberculous meningitis.

SKIN TEST, PRECIPITIN, AND COMPLEMENT FIXATION TESTS

The intradermal skin test with coccidioidin is usually positive in the primary as well as in the disseminated form of coccidioidomycosis. The antigenic material used is derived from broth cultures of the fungus. Ordinarily a strength of 1 to 100 is employed, however, in cases with manifestations of allergy (erythema nodosum or erythema induration) it is safer to use more dilute solutions of 1 to 1,000 or 1 to 10,000. The test is read in 24 hours and 48 hours. The sensitivity usually remains for life; sensitivity to coccidioidin develops in from 2 to 21 days (13). Thus a positive skin test to coccidioidin usually means that the patient either has or has had a coccidioidal infection. It resembles the tuberculin skin test in this respect. Emmons (14) has shown that a cross-reaction may occur with histoplasmin, blastomycin, and haplosporangin, and that skin tests to antigens derived from fungi are not always specific. However, according to Smith (13), a positive skin test to coccidioidin can be interpreted as either a past or present infection with coccidioidomycosis. In the disseminated form, the skin test may not always be positive.

Humoral antibodies and precipitins develop in the second or third week of the disease and the fixation of complement occurs at about this same time (13). Precipitins tend to develop only in the more severe infections. By following the complement fixation reaction, information is gained as to how well the body is handling the infection, and whether dissemination will occur. Dr. C. E. Smith, of the Stanford Medical School, performed the precipitin and complement fixation tests on our patients.

SKIN MANIFESTATIONS

The skin manifestations of coccidioidomycosis are of two types; the allergic and the true coccidioidal granulomas of the skin.

The allergic manifestations (erythema nodosum and erythema multiforme) occur in the primary pulmonary forms of the disease in from 2 to 5 percent of cases (8) (9) (13) and appear more frequently in the female. The skin rash appears in from 3 to 18 days after the onset of the initial symptoms and in the mild cases may be the symptom that bring the patient to the physician. The erythema nodosum and erythema multiforme lesions that occur with coccidioidomycosis cannot be distinguished from the same type of eruption that occurs with other infections and toxemias, and form only part of the clinical picture.

The skin lesions that occur in the disseminated form of the disease are caused by true infection of the skin with the fungus. These lesions are granulomatous in character and cannot be distinguished morphologically from other granulomatous infections of the skin (tuberculosis of the verrucoid or scrofulodermatous types, tertiary syphilis, blastomycosis, actinomycosis, and histoplasmosis). However, a positive diagnosis can usually be made by finding the causative organism in smears, cultures, or histologic sections.

DIAGNOSIS

Primary coccidioidomycosis should be suspected whenever an unusual form of pneumonia or pneumonitis is observed in an endemic locality. The presence of pneumonitis and enlarged hilar nodes is suspicious, as is the finding on roentgenogram of thin-walled cavities in nontuberculous patients, the presence of large nodular infiltrations with or without a central area of abscess formation, and of long-standing pleurisy with effusion. If erythema nodosum or erythema multiforme is also present the diagnosis of coccidioidomycosis becomes more certain. A positive skin test with the confirmatory finding of specific precipitins or a positive complement fixation test confirms the diagnosis. Finding of the specific organism in the sputum or culture is difficult but when found it verifies the diagnosis.

In the disseminated form, lesions may occur in any organ of the body. Disseminated lesions in the skin must be distinguished from other granulomatous infections. Disseminated lesions in the lung especially must be distinguished from pulmonary tuberculosis and carcinoma. Infection of the meninges may closely resemble a tuberculous meningitis or cord tumor. Lesions in bones produce bone destruction which may involve the cortex, medulla, and also the periosteum. In the disseminated lesion, the diagnosis can be suspected from a positive skin reaction with a positive precipitin and complement fixation, but can be definitely made only by finding the organism on culture or histologic section.

In the past 2 years there have been 9 patients with proved coccidioidomycosis in the U. S. Naval Hospital, San Diego. Two who had the disseminated type died and autopsy was done. It is believed that these cases are of sufficient interest to warrant reporting.

CASE REPORTS

Case 1: Disseminated coccidioidomycosis in a 21-year-old Negro male, with disseminated lesions in the meninges, skin, lung, spleen, lymph nodes, and ribs.

E. A. H. was admitted to the U. S. Naval Hospital, San Diego, from Camp Elliott on 26 January 1946. He complained of upper abdominal pain of 2 days' duration and of soreness of the anterior chest wall for the preceding 2 weeks. Prior to the onset of these symptoms he had been in good health. There had been no cough or expectoration. On physical examination the temperature was 101.6° F. and pulse 100; some tenderness over the upper abdomen but no spasm or rigidity; a mild degree of generalized lymphadenopathy. There were two small, painless, umbilicated ulcerating lesions, which had been present since the onset of the illness, one on the anterior upper abdomen and one on the back. The white blood cell count was 11,000; differential, 1 juvenile, 7 bands, 60 segmented, 10 lymphocytes, 18 eosinophils, 1 basophile, and 3 monocytes. Subsequent differential counts showed an eosinophilia of 17, 14, and 24 percent. The blood Kahn reaction was negative. The urine was normal and the sedimentation rate was 18. Roentgenogram of the chest showed evidence of pneumonitis of the left lower base. On 14 February a specimen of tissue from the skin lesion on the upper abdomen was removed for biopsy. The microscopic examination showed it to be a granulomatous lesion which contained many spherules of *Coccidioides immitis*. On 26 February 1946 and again on 20 March 1946 skin tests with coccidioidin were negative.

The septic fever continued and evidence of widespread pulmonary involvement appeared. On 29 March a fluctuant mass appeared over the sternum. On aspiration, thick pus was obtained which, on microscopic examination, showed many spherical organisms which morphologically resembled spherules of *Coccidioides immitis*. On 5 April, signs of meningeal irritation developed. A spinal tap showed that the fluid was clear with a pressure of 125 mm. water. A Quackenstadt test showed no evidence of blockage. Microscopic examination of the spinal fluid showed many white blood cells and many spherical organisms which morphologically resembled *Coccidioides immitis*. The patient became comatose and died on 6 April 1946.

On autopsy the mediastinal lymph nodes were enlarged and caseous. Both lungs were almost completely consolidated. On cut section there were numerous white, firm miliary nodules up to 8 mm. in diameter. In the left lower lobe near the periphery there was a caseous abscess measuring 8×10 cm. in diameter. There was moderate hyperplasia of the retroperitoneal lymph nodes. On opening the skull there was an extradural abscess 3 cm. in diameter over the vortex. The meningeal vessels were congested. The cerebrospinal fluid was slightly turbid. In the pialachnoid there were many minitary abscesses over the entire brain.

There was a large subcutaneous abscess measuring 10×12 cm. over the body of the sternum and eroding through it to the inner periosteum (fig. 1). There was a similar process involving the third left rib over the anterior axillary line.

The anatomical diagnosis, confirmed by microscopic examination, was disseminated coccidioidomycosis involving the meninges of the brain, lung, spleen, lymph nodes, sternum, and third left rib.

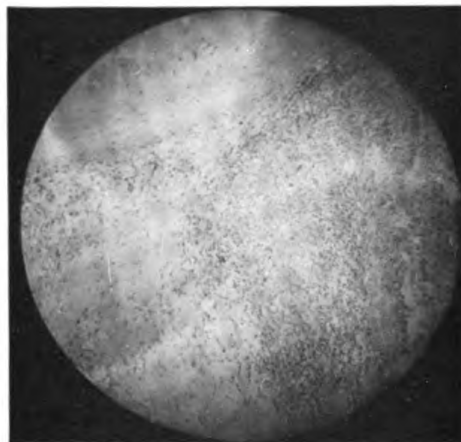


Figure 1.—Case 1. Microscopic section of granulomatous lesion involving the sternum. Note the numerous spherules of "*Coccidioides immitis*" within epithelioid tubercle formation surrounded by lymphocytes.



Figure 2.—Case 2. *Coccidioidomycosis* with enlargement of the right hilar lymph node; associated pneumonia and pleuritis involving the lower part of the right middle lobe of the right lung.

Case 2: Severe primary pulmonary involvement without dissemination, simulating a lung tumor.

A. F. B., a 31-year-old officer, was admitted to the dispensary, U. S. Naval Air Station, Seattle, Wash., on 20 October 1946 complaining of pain in the upper right chest, dyspnea, and cough. Several weeks prior to this he had been vacationing in San Diego, Calif. Roentgenogram of the chest showed an area of increased density, measuring 7 cm. in diameter, in the right hilar region and extending outward to the periphery along the interlobar septum between the right upper and middle lobes. This was interpreted as an area of atelectasis and he was transferred to the U. S. Naval Hospital, Seattle, with the diagnosis of "Diagnosis Undetermined (Mediastinal tumor)." He was subsequently transferred to the U. S. Naval Hospital, Oakland, Calif., on 24 November 1946 with a diagnosis of atelectasis. During the period of hos-

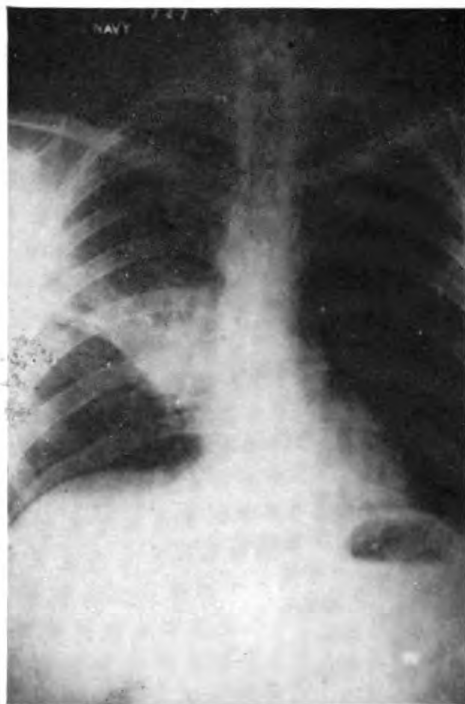


Figure 3.—Case 2. Resolution of the pneumonitis and pleuritis and hilar node involvement.

pitalization there, the area of density gradually resolved and after 30 days' convalescent leave he was admitted to the U. S. Naval Hospital, San Diego, on 18 January 1947.

Roentgenogram of the chest on 28 January revealed an enlargement of the right hilar lymph nodes with an area of increased density involving the lower portion of the right upper lobe, extending to the periphery and running parallel to the interlobar fissure (fig. 2). The red blood cell count was 5,100,000; the white blood cell count, 8,600. On 11 February a skin test with 1:1000 dilution of coccidioidin gave a 4-plus reaction. Skin tests to tuberculin, histoplasmin, and haplosporangin were negative. The sputum was negative for acid-fast bacilli. The sedimentation rate was 5 mm./hr. The blood Kahn reaction was negative and the urine was normal.

Blood serum drawn 29 March 1947 was sent to Dr. C. E. Smith for complement fixation and precipitin studies. The complement fixation was positive in

dilutions up to 1:16. Precipitin could not be determined because of contamination. The complement fixation indicated a moderately severe coccidioidal infection. On 2 April 1947 a roentgenogram of the chest (fig. 3) showed some reduction in the size of the hilar nodes on the right with some decrease in the area of increased density in the region of the right interlobar septum between the middle and lower lobes and many fibrotic strands running out to the periphery of the lung.

The patient was ambulatory during his entire period of hospitalization. He was discharged to duty 16 May 1947.

Case 3: Primary pulmonary coccidioidomycosis simulating unresolved pneumonia.

C. H. V., a 62-year-old retired machinist, was admitted to the U. S. Naval Hospital, San Diego, Calif., 27 May 1947 complaining of chills, fever, headache, cough, expectoration, and chest pain of 1 week's duration. He had resided in southern California in the region of San Diego for the past 2 years.

On physical examination, the temperature was 103.8° F.; pulse, 88; respirations, 23; and blood pressure 142/90. There were enlarged anterior and posterior cervical lymph nodes and physical findings of consolidation of the right upper lobe with a loud friction rub. The red blood cell count was 4,300,000; the hemoglobin 13 gm.; the white blood cell count, 6,000; and the sedimentation rate, 22 mm./hr. The urinalysis and blood Kahn reaction were negative for acid-fast bacilli. Roentgenogram of the chest showed a triangular area of consolidation of the right upper lobe, characteristic of lobar pneumonia (fig. 4).

This patient remained quite ill for the first 5 days of his hospitalization, with a temperature elevation to 103° F. with recurrent chills. Following this his

temperature dropped by lysis during a period of 10 days. Coccidioidomycosis was suspected because the consolidation of the right upper lobe resolved slowly. On 18 June 1947, a coccidioidin skin test, using a dilution of 1:1000, was 2 plus. A tuberculin test using PPD No. 1 was negative; histoplasmin skin test was also negative. A specimen of blood serum was sent to Dr. C. E. Smith who reported that the complement fixation was positive in a strength up to 1:16 and precipitin tests were 4-plus in the undiluted specimen.

The patient gradually improved, became asymptomatic, and ambulatory, and was discharged 26 July 1947.

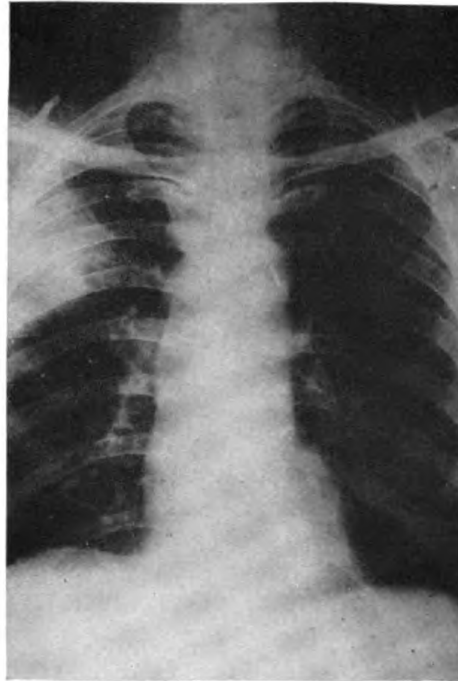


Figure 4.—Case 3. Primary pulmonary coccidioidomycosis with an area of consolidation in the right upper apex simulating lobar pneumonia.

Case 4: Primary pulmonary coccidioidomycosis in the left apex simulating active pulmonary tuberculosis.

A 46-year-old Chief Quartermaster, U. S. N. R., who had resided in the San Diego area for several years, was admitted to the U. S. Naval Hospital 28 May 1947. A routine roentgenogram of the chest on expiration of enlistment and transfer to the Fleet Reserve; had revealed an area of increased density, suspicious of pulmonary tuberculosis, in the left apex.

There was no history of weight loss, night sweats, anorexia, fatigability, chest pain, hemoptysis, or dyspnea. He had had a slight cough and some expectoration for 15 years. Physical examination was negative.

Laboratory tests showed a red blood cell count of 5,300,000; white blood cell count, 9,300; and sedimentation rate, 4 mm./hr. The blood Kahn reaction was negative. Sputum examinations were negative for acid-fast bacilli. Roentgenogram of the chest revealed a minimal area of infiltration of the left upper lobe which was suspicious of minimal pulmonary tuberculosis (fig. 5). The tuberculin skin test, using first and second strength PPD, was negative. A coccidioidin skin test was 3-plus. There was no history of erythema nodosum.

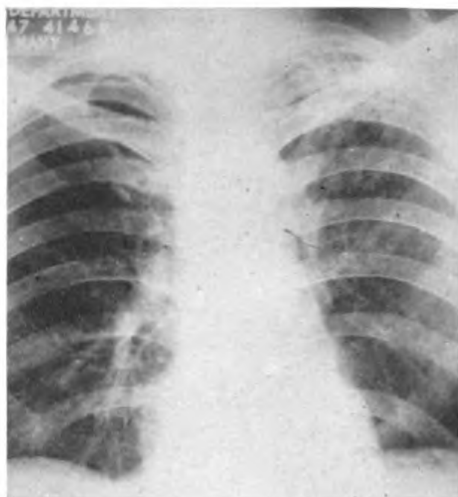


Figure 5.—Case 4. *Primary pulmonary coccidioidomycosis involving the left upper lobe; roentgenographic findings simulated minimal apical tuberculosis.*

During the period of hospitalization the patient was ambulatory and asymptomatic. It was assumed that the area of infiltration in the left upper apex was coccidioidal in origin because of the negative tuberculin reaction and the positive coccidioidin reaction. He was discharged from this hospital and transferred to the Fleet Naval Reserve on 22 August 1947 with a diagnosis of coccidioidomycosis, pulmonary type, without dissemination.

Case 5: Primary pulmonary coccidioidomycosis with erythema nodosum.

R. F. S., a 19-year-old male, was admitted from the U. S. Naval Air Facility, Litchfield, Ariz., 6 June 1947, complaining of weakness and pain in the chest. He had been treated for pneumonia for 2 weeks prior to admission to the U. S. Army Hospital in Phoenix, Ariz. He had had poliomyelitis at the age of 12 and had had pneumonia 3 times; the last time, March 1946, he had had measles complicated by bronchopneumonia.

Physical examination at admission showed a thin, emaciated young male with a normal temperature. The lymph nodes of the axilla were slightly enlarged. On auscultation, there were râles over both upper lung fields. Admission roentgenogram of the chest was negative. Laboratory examination: red blood cell count, 4,500,000; hemoglobin, 14 gm.; white blood cell count, 7,400 with 40 percent segmented, 38 percent lymphocytes; 10 percent eosinophils, and 6 percent basophiles. On 24 June, red blood cell count was 4,700,000; hemoglobin, 15 gm.; white blood cell count, 14,800 with 15 percent segmented, 16 percent lymphocytes, 18 percent eosinophils, and 8 monocytes; sedimentation rate, 19 mm./hr. (Cutler); urinalysis, normal; agglutination tests for typhoid, paratyphoid, OX19, and *Bacillus abortus* were negative.

The patient, after admission, had afternoon temperature elevation to 100° F. He continued to complain of anorexia, easy fatigability, and pain in the chest. A repeat roentgenographic examination of the chest on 25 June revealed a pneumonitis involving the peripheral portion of the left lung, most marked in the lower fields, and a small area of pneumonitis in the right second anterior interspace.

On 26 June he developed red, painful erythematous nodules on both legs. These were from 1 to 2 cm. in diameter involving the superficial skin over both tibiae and were characteristic of erythema nodosum. It was assumed that this patient had coccidioidomycosis because of the association of erythema nodosum with pneumonitis. A skin test, using a dilution of 1:1000 coccidioidin, was done on 26 June and gave a 3-plus reaction. Serum was collected and sent to Dr. C. E. Smith who found that there was no fixation of complement.

Precipitin tests could not be done because the specimen was contaminated. It was Dr. Smith's conclusion that this, most likely, was a case of coccidioidomycosis inasmuch as there was pneumonitis, erythema nodosum, and a positive skin test. On 4 August tuberculin skin tests, using PPD Nos. 1 and 2, were negative. The area of pneumonitis gradually resolved and roentgenogram on 18 August 1947 showed that the areas of increased density had completely resolved. The patient was returned to duty on 26 August 1947.

Case 6: Primary pulmonary coccidioidomycosis with roentgenographic findings suggestive of a tumor of the lung.

F. F. W., a 50-year-old retired Chief Commissary Steward, was admitted to the U. S. Naval Hospital, San Diego, on 31 March 1947 complaining of chills,

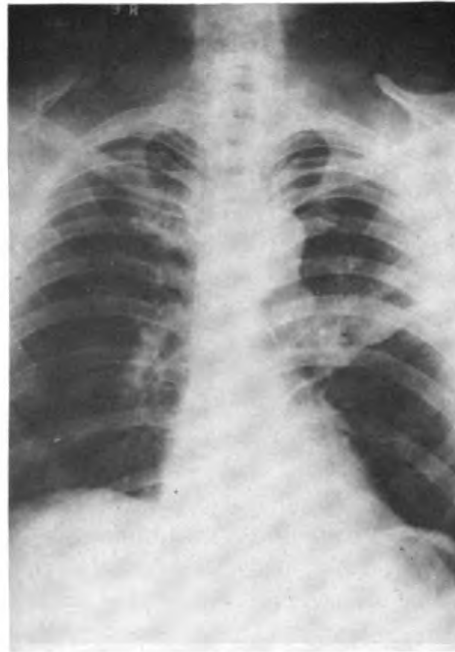


Figure 6.—Case 6. Primary pulmonary coccidioidomycosis with enlargement of the left hilar lymph node and an area of pneumonitis involving the lower portion of the left upper lobe.

fever, night sweats, and a 15-pound weight loss during the past 4 weeks. He was admitted with a diagnosis of "Diagnosis Undetermined (Mediastinal tumor)." He had had a hemilaryngectomy for carcinoma of the larynx in April 1946. He had been perfectly well following this except for mild chronic cough and hoarseness, until the onset of the present illness.

Roentgenogram of the chest taken prior to admission (12 March) revealed a fairly well circumscribed tumor mass of the left hilum with what was interpreted as partial atelectasis of the lower portion of the left upper lobe. The impression was that of primary bronchogenic carcinoma (fig. 6).

The red blood cell count was 5,501,000; hemoglobin, 14 gm.; white blood cell count, 8,900 with a differential of 3 percent bands; 67 percent segmentals; 24 percent lymphocytes; 1 percent eosinophils; and 5 percent monocytes. The sedimentation rate was 16 mm./hr. Sputum examinations were negative for acid-fast bacilli. A tuberculin skin test, using PPD No. 1, was negative. The blood Kahn reaction was also negative. A bronchoscopic examination on 1 April was essentially negative. A specimen for biopsy was taken from the

area of the hemilaryngectomy and microscopic examination showed it to be normal bronchial mucosa. On 9 April a coccidioidin skin test, using a dilution of 1:1000, gave a 3-plus reaction. Blood serum was collected and sent to Dr. C. E. Smith who found complement fixation in dilutions up to 1:8 and precipitins present in dilutions up to 1:40. Tests for histoplasmin were negative.

The patient gradually improved. The mass in the hilum disappeared after 4 months and he was discharged to duty on 12 May.

Case 7: Erythema nodosum due to coccidioidomycosis with very minimal pulmonary involvement.

G. W., a 49-year-old dependent female, was admitted to this hospital on 21 April 1947. She had been well until 1 week prior to admission when she noted a nodular red eruption on her legs which soon spread to the lower part of the trunk. She had been well until the previous Christmas when she developed malaise, fatigability, and repeated colds with some cough and rhinitis.

Physical examination at admission was not remarkable except for the erythematous infiltrated lesions, typical of erythema nodosum, on the extensor surfaces of the lower extremities and lower portion of the trunk. Since the patient's husband was in the hospital recovering from an attack of pulmonary coccidioidomycosis, it was assumed that the erythema nodosum was coccidioidal in origin and a skin test with coccidioidin, using a dilution of 1:1000 was promptly done. It was 4 plus. A skin test to tuberculin, using PPD No. 1, was negative.

The red blood cell count was 4,000,000; hemoglobin, 12 gm.; white blood cell count, 12,650 with a differential of 6 percent bands; 62 percent segmentals; 22 percent lymphocytes; and 10 percent eosinophils. The sedimentation rate was 12 mm./hr. (Cutler); blood Kahn reaction, negative; and blood cultures, negative. Sputum was negative for acid-fast bacilli. A repeat blood count 10 days after admission was: red blood cell count, 4,400,000; hemoglobin, 13 gm.; white blood cell count, 8,000 with 56 percent segmentals; 34 percent lymphocytes; 10 percent eosinophils; and the sedimentation rate, 26 mm./hr. Sputum on microscopic examination was negative for spherules of *Coccidioides immitis*. Blood serum was collected and sent to Dr. C. E. Smith. There was no complement fixation and the serum was negative to precipitin. Dr. Smith's comment was as follows: "There is no question but that the etiology of the erythema nodosum is coccidioidal. Without pulmonary lesions it is evident that the coccidioidal infection is minimal and the main manifestations were allergic. For this reason if precipitins were present they were transitory and are no longer demonstrable. The negative fixation confirms the excellent way the infection is being handled."

It is interesting to note that prior to the onset of both the patient's and her husband's illness, they had spent a day cleaning out the chicken coop on their ranch in the back country of San Diego. During the process they inhaled considerable dust from the hen house which presumably contained the chlamydospores of *Coccidioides immitis*.

Case 8: Primary pulmonary coccidioidomycosis with roentgenographic findings closely simulating those of metastatic sarcoma of the lungs.

A. E. W., a 54-year-old retired ACMM, was admitted to the U. S. Naval Hospital, San Diego on 13 July 1947, complaining of dyspnea, fatigability, cough, chest pain, and weight loss of 2 months' duration. He had had 2 attacks of



Figure 7.—Case 8. Primary pulmonary coccidioidomycosis with roentgenograms simulating metastatic sarcoma. Note the large nodular areas of infiltration in the right lower lobe.

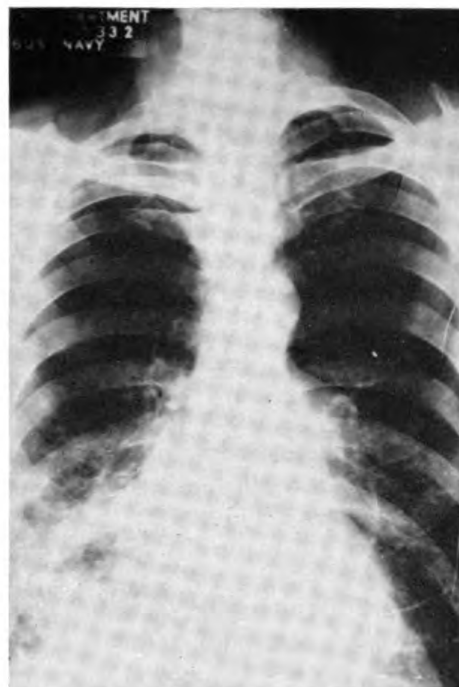


Figure 8.—Case 8. Note the clearing of the heavy areas of pulmonary infiltration with residual hilar node enlargement and many heavy fibrotic strands running from the involved area to the hilar nodes.

chest pain which were diagnosed as pleurisy and his chest was taped 2 weeks prior to admission.

Physical examination showed a chronically ill middle-aged white male, with marked dyspnea, frequent cough, and some cyanosis around the lips. There was dullness to percussion on the right base from the fourth interspace downward with wheezing râles on auscultation.

Roentgenograms of the chest on 17 July showed "a rounded shadow of increased density of 3 cm. in diameter in the left hilar region. There are three fairly well circumscribed masses, the lowest of which is approximately 7 cm. in diameter in the right base. Rule out metastatic malignancy." (Fig. 7.)

The red blood cell count was 5,000,000; hemoglobin, 15 gm.; white blood cell count, 7,500; blood Kahn reaction, negative; and urinalysis, normal. Sputum examinations on microscopic examination showed no acid-fast bacilli or fungi. A thorough examination failed to reveal evidence of a primary malignancy anywhere in the body. Intravenous pyelograms were normal. Bronchoscopic examination performed on 29 July 1947 was essentially negative except for mucoid discharge throughout the left lower bronchus. A barium enema and gastro-intestinal series were negative. A repeat roentgenogram of the chest on 4 August, 3 weeks after admission, showed a marked clearing of the masses in the right base and a large amount of residual fibrosis, thickened pleura, and hilar node enlargement (fig. 8).

It was thought that this might be a coccidioidal infection because of the marked clearing in the large areas of increased density. On 8 August a coc-

cidoidin skin test, using 1:1000 dilution, was done, the result was 3 plus. Tuberculin skin test, using PPD No. 1, showed a 1-plus reaction. Blood serum was collected and sent to Dr. Smith. The serological specimen showed positive complement fixation in dilutions up to 1:16 and precipitins were present in the undiluted specimen. Dr. Smith's conclusion was as follows: "Findings confirm the suspicion of coccidioidal infection. Undoubtedly it was the cause of the pulmonary lesion. The infection seems to be well in hand."

The patient gradually improved and was discharged on 2 September 1947 greatly improved. It should be noted that this patient lived in the desert area of Arizona for the previous 2 years.

Case 9: Primary pulmonary coccidioidomycosis with dissemination to the meninges.

H. B. K., a 56-year-old veteran, was admitted to this hospital on 13 September in an irrational, confused state. The past history, as related by the patient's wife, was of morning and afternoon temperature elevations, nonproductive cough, marked fatigue, and weight loss for the preceding 5 months. The patient also complained of frequent headaches and a feeling of heaviness in the epigastrium for the past year.

Physical examination showed evidence of marked emaciation, dehydration, and recent weight loss. He was irrational. The remainder of the examination was negative except for changing and confusing neurological findings. Various



Figure 9.—Case 9. Microscopic section of the meninges. Note the spherule of *Coccidioides immitis* within a giant cell.

diagnostic procedures, including funduscopy, blood studies, urinalysis, and chest roentgenograms, were negative or normal. Spinal fluid, on examination, revealed an increase of pressure to 290 mm. water, a mild midzonal curve on the colloidal gold test, proteins elevated to 180 mg., a positive Pandy test, and a cell count of 202 with lymphocytes predominating.

Prior to admission to this hospital, the patient had been studied by his private physician who suspected a bronchogenic carcinoma because of a suspicious infiltrated lesion in the left hilar area. A bronchoscopic examination was done, but nothing of significance was seen. The evidence of bronchial infection subsided under penicillin, aerosol, and sulfadiazine therapy.

A generalized lymphadenopathy developed and a specimen of tissue for biopsy showed only chronic inflammation. Roentgenograms of the gastro-intestinal tract revealed no evidence of malignancy. The left maxillary antrum was washed out because of a chronic infection. Neurological examination and the usual agglutination tests were negative. During his hospitalization at this hospital the patient's course was steadily downhill. He remained mentally confused and comatose. The neurological findings were confusing and only an occasional nuchal rigidity was noted. He died on 7 October 1947. The clinical diagnosis was tuberculous meningitis, or brain tumor.

On autopsy, the gross findings were as follows: abscess, multiple, brain, anterior and optic chiasma; hydrocephalus, both lateral ventricles; edema, cere-

bral, mild; granuloma, nonspecific, lung, left upper lobe (2 cm. in diameter); pansinusitis, chronic; tuberculosis, pulmonary, healed; emphysema, pulmonary, generalized; bronchopneumonia, terminal; valvulitis, chronic, rheumatic, tricuspid, moderate; chronic passive congestion, liver; nephrosclerosis, arteriolar, left; and cystitis, nonspecific, chronic.

On microscopic examination, the sections of the meninges of the spinal cord and the cerebellum were found to harbor many spherules of *Coccidioides immitis*. From the autopsy findings it was evident that this was a case of pulmonary coccidioidomycosis which disseminated to the meninges producing death (fig. 9). No other organs were involved and there was no evidence of involvement of the skin.

SUMMARY

Primary pulmonary coccidioidomycosis occurs frequently in the endemic areas in the Southwestern part of the United States. The primary pulmonary form may be so benign as to escape detection. Frequently, however, it produces symptoms and findings that may closely simulate lobar pneumonia, nonspecific pneumonitis, pulmonary tuberculosis, and new growths. It is usually accompanied by hilar node involvement and can be easily diagnosed by specific tests (skin tests with coccidioidin, complement fixation, and precipitin tests) if the disease is suspected. In 5 percent of the cases there is an accompanying erythema nodosum or erythema multiforme which is an allergic manifestation of the disease.

The disseminated form of the disease occurs more rarely, in about 1 case in 400. It carries a mortality of 50 percent or more and follows the primary form in from several months to 10 years or longer. In the disseminated form any organ in the body may become involved and it must be differentiated from other granulomatous infections.

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Precancerous Lesions

Lesions such as leukoplakia buccalis, leukoplakia of the bladder or vagina, ulcer of the lip, erosion of the cervix, gastric ulcer, rectal polyp, and nodule of the breast on careful physical examination, including biopsy, as a rule show no evidence of malignancy. Although indications may be lacking that malignant changes will occur in such lesions, statistics prove that such lesions do become malignant. Therefore, these lesions must be considered precancerous and for this reason preventive surgery should be the fundamental rule in the treatment of these conditions.



Ureterosigmoidostomy

Experience With the Nesbit Technique

WILLIAM W. MILLER, JR., *Lieutenant (MC) U. S. N.*

PRIOR to the publication of Nesbit's technique (1), the only methods of performing ureterosigmoidostomy were those based on the work of Coffey (2). However, his three methods were aimed at creating a valvelike mechanism. This type of urinary drainage is contra-indicated in hydroureter. Nesbit's method has no such limitation. Hydronephrosis, previously a serious complication of ureterosigmoidostomy, is in a great part prevented by this technique as shown in the results in our cases.

In the past year the author has performed this operation on eight patients and assisted on the ninth (U. S. Naval Hospital, Bethesda, Md.). The method is simple, but delicate, and gives uniformly good results in preventing the development of post-operative hydronephrosis and upper urinary tract infections.

Every urologist has his own indications for doing ureterosigmoidostomy. Its application is wide and it can be used either for curative or palliative purposes in many of the following conditions: congenital anomalies of the bladder and urethra such as extrophy and epispadias; various injuries destroying the bladder; severe intractable cystitis; and carcinoma of the urinary bladder or urethra.

Extrophy and epispadias are problems of proper drainage. It is unreasonable to permit a child to go through life constantly dribbling urine which further handicaps him in the enjoyment of life. Prior to the advent of the sulfonamides and antibiotics it was advisable to perform ureterosigmoidostomy in the first few weeks of life before pathogens appear in the gastro-intestinal flora. Now, since it is possible to sterilize the bowel contents with the sulfonamides and streptomycin, the optimum time to perform the ureterosigmoidostomy is at about 1 year of age, before urinary tract damage by ureteral dilatation occurs.

Various pelvic injuries such as gunshot wounds and automobile accidents may damage the urethra or bladder to such an extent that suprapubic drainage is not sufficient and ureterosigmoidostomy is indicated.

Relief of intractable cystitis with its pain and urinary frequency particularly in cases of Hunner's ulcer, and in nonspecific cystitis either allergic or inflammatory, which has progressed beyond cure by medical means are also indications for this operation.

The advisability of transplanting ureters to the bowel in tuberculosis is subject to considerable criticism at the present time.

Carcinoma of the urinary bladder demands early diagnosis and vigorous therapy. Any lesion, papillary or sessile, of Grade II (Broders) malignancy or greater, where local and distant metastases are not demonstrable should have the benefit of radical surgery, including bilateral ureterosigmoidostomy, total cystectomy, prostatectomy, seminal vesiculectomy, and, possibly, complete ablation of the pelvic and pre-aortic lymph chain. In the female a hysterectomy should also be done. Urethral carcinomas do not alter this dictum, except to include urethrectomy and partial vulvectomy in the female, by a combined abdominal-perineal approach, and radical dissection of the penis in the male. In the advanced cases this method of palliative urinary diversion is elective, since simple types of urinary diversion operations are available. Some cases in which a curative attempt is made solely on pre-operative data fall into this category. If the comfort one of these cases enjoyed to his death is any index, such palliation might be subscribed to.

The gynecologist finds a certain group of his cases, particularly carcinoma of the cervix or uterus, in which ureterosigmoidostomy is indicated. In those selected cases it is necessary to do the Brunschwig operation (3). Certain vesicovaginal fistulas, particularly repair failures after repeated operations are candidates for uretero-intestinal anastomoses before a concurrent rectovaginal fistula occurs.

PREPARATION OF THE PATIENT

The patient is prepared according to a modified Mile's regime. A low or nonresidue diet, Sulfathaladine 0.5 gm. four times daily, and penicillin are prescribed for 7 days. On the second, fourth, and sixth days cleansing tap water enemas are given until the return is clear. One ounce of milk of magnesia is given on the first, third, and fifth days. Streptomycin is administered for 3 days pre-operatively in two 1 gm. daily doses and usually continued for 3 or 4 days post-operatively. If necessary, pre-operative transfusions are given to bring the hemoglobin to normal levels. A series of pre-operative intravenous pyelograms are made. A general anesthetic by the intratracheal technique in conjunction with the use of curare for relaxation is preferred. Before the patient is draped a large mushroom catheter or rectal tube is inserted per rectum. The patient is kept well hydrated during surgery by intravenous fluids and blood.

to prevent shock and to permit a flow of urine by the time the patient leaves the surgical suite. Shock is always imminent during lengthy surgical operations.

THE URETEROSIGMOIDOSTOMY

The ureters are approached through a transverse lower abdominal incision 2 or 3 finger-breadths above the symphysis pubis cutting the belly of both recti. After entering the peritoneum the necessary Trendelenberg position is obtained and the intestines carefully packed away to provide adequate exposure; only the redundant sigmoid is left in the field. The right ureter is located behind the posterior peritoneum, which is incised for 3 to 4 cm. along the longitudinal axis of the ureter as deep in the pelvis as practicable. Ureteral length is very important and as little as possible is sacrificed. By blunt dissection the ureter and as much peri-ureteral tissue as possible is freed up to the bladder level. One Lahey gallbladder clamp is applied and the ureter divided proximally to it. The distal stump is ligated with No. 1 chromic suture. One No. 0000 or No. 00000 chromic suture is placed from the inside out on the distal end of the proximal stump on the side of the ureter which was in contact with the peritoneum (fig. 1-3). No effort is made to prevent the flow of urine into the abdominal cavity. Peritonitis from small amounts of sterile urine is unheard of. The left ureter is handled next in a similar fashion. Next, location of the anastomosis is determined. This must be in an area where tension on the suture lines or kinking of the ureters after they are anastomosed will not occur. With Babcock clamps applied to the tenia of the sigmoid, a longitudinal incision is made on the surface of the ureter which was facing away from the peritoneum (fig. 1-1). Another suture is placed from inside out, in the angle of the V formed when the ureter is open, for approximately 1.5 cm. (fig. 1-3). After the right anastomosis is completed the left ureter is similarly handled.

The bowel is opened between the Babcock clamps at the predetermined site for a distance of approximately 1.5 cm. (figs. 1-1 and 1-2). An elliptical end-to-side ureterosigmoid anastomosis is then carried out. The last suture is employed to fix the lateral side of the anastomosis, where a simple over-and-over inverting suture includes all layers of the ureter and bowel (fig. 1-4). A running Connell suture with a new strand of chromic No. 0000 or No. 00000 is utilized to close the medial side of the juncture (figs. 1-5 and 1-5A). All but the last knot is tied inside the lumen of the anastomosis. On completion, a gentle pinch to the ureter will produce a peristaltic wave and the functional capacity is checked. Figure 1-6 shows the completed ureterosigmoidostomy. If there are any leaks (there should be none)

one or two interrupted sutures through the muscularis of the bowel and ureter will seal them. One or two inches higher up on the colon the left ureter is connected to the bowel.

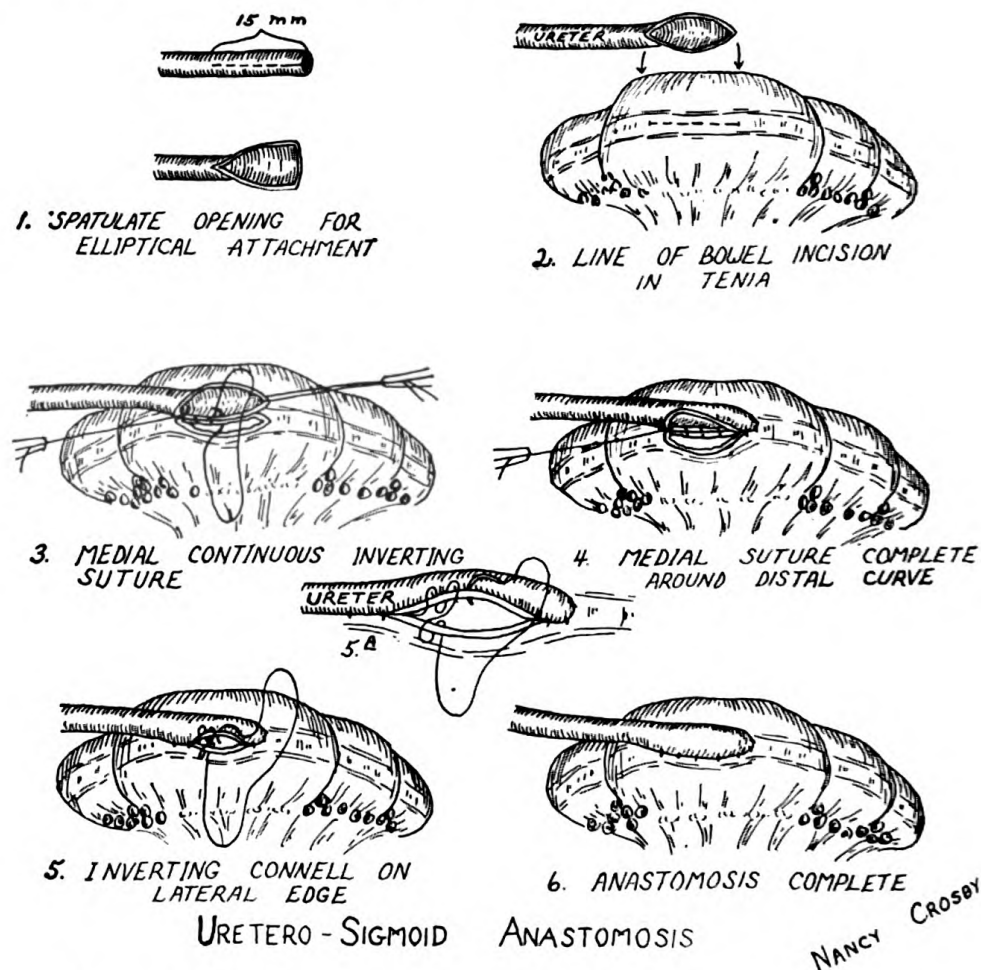


Figure 1.—Illustrations showing the steps of the ureterosigmoidostomy.

As shown in the diagram, the diameter of the anastomosed part of the ureter is increased by the mathematical factor, 3.1416. Thus, a spatulate, elliptical, end-to-side anastomosis with the least possibility of encroachment upon the circular opening of the ureter is formed. There is little chance of constriction or interference with the flow of urine.

After closure of the posterior peritoneum with interrupted No. 1 chromic sutures, allowing about a 1 cm. gap where the ureter enters the peritoneum, the colon is fixed to the lateral pelvic peritoneum with two or three No. 0000 chromic sutures. The intraperitoneal end-to-side elliptical ureterosigmoidostomy is completed. If a total cystectomy, prostatectomy, or seminal vesiculectomy is to be done the peritoneum is first closed. The peritoneal cavity is not drained but the

extraperitoneal cavern is drained both suprapubically and per urethrum following cystectomy.

POST-OPERATIVE CARE

A Levine tube is inserted before the patient leaves the surgery; drainage is continued until bowel peristalsis is well established. Nothing is given by mouth until good bowel activity is present; ileus and abdominal distention are distressing complications. Blood transfusions are given to maintain the blood count at normal levels during the entire convalescence. Fluid and electrolyte balance is maintained. Both the intake and output are carefully checked. Bed rest is absolute until at least the fifth day. The rectal catheter is removed between the fifth and seventh days depending upon the condition of the patient. A low residue diet is allowed when the patient can take food. Penicillin is usually continued until the wounds appear well healed. The sutures and drains are removed on the seventh day and the first post-operative intravenous pyelograms are taken. The patient is usually discharged from the hospital between the fourteenth and twenty-first days if there have been no complicating factors.

Rectal frequency is an individual problem. However, the younger the patient the easier he accommodates to a common cloaca. Nocturia, from one to four times, and diuria, every 2 to 4 hours occurs. Some of the patients are able to distinguish between the desire to pass urine or feces.

CASE REPORTS

Case 1.—W. G., a 64-year-old Negro male was admitted to the U. S. Naval Hospital, Bethesda, Md., on 3 May 1948 because of a history of intermittent gross hematuria, urethral pain, dysuria, diuria, and nocturia of three to four times.

Physical examination.—There was a large ventral hernia, a diastolic heart murmur, and moderate cardiac enlargement. The prostate was moderately enlarged. Cystoscopic examination showed cystitis, two small diverticulae, and trilobar obstructing hypertrophy of the prostate. A transurethral resection of the prostate was done at that time. However, hematuria continued until 3 July 1948 when he was readmitted to this hospital. Cystoscopic examination at this time revealed a sessile growth overlying the right ureteral orifice. Tissue taken for biopsy showed Grade III transitional cell carcinoma of the urinary bladder. There was no physical or roentgenographic evidence of metastases. Intravenous pyelograms were normal. He refused to submit to any treatment at this time. On 11 September he returned to the hospital with increasing hematuria and difficulty. The hemoglobin was 8 gm. Intravenous pyelograms showed a normal left kidney and a nonfunctioning right kidney.

Bilateral ureterosigmoidostomy and total cystectomy were performed on 17 September 1948 and the ventral hernia was repaired. The post-operative pyelograms showed bilateral renal function with hydronephrosis. He was able to distinguish between urine and feces. Post-operatively he voided every four hours during the day and two to four times at night. The patient did exceedingly well for 8 months when he returned to the hospital with urethral bleeding; on readmission local metastasis was noted. High voltage roentgen therapy was



Figure 2.—The post-mortem urinary tract showing No. 6F ureteral catheters in the rectal ostia of the ureters.



Figure 3.—Retrograde pyelogram in the post-mortem specimen.

of no value, and he died on 28 May 1949. Autopsy showed generalized carcinomatosis. The kidneys, ureters, and rectum were removed en masse and showed the anastomoses to be complete without obstruction to the flow of urine (fig. 2). A left-sided purulent infection involved the ureter, kidney, and pelvis; some hydronephrosis was present (fig. 3).

Case 2.—G. T. M., a 62-year-old white male was admitted to this hospital on 12 December 1948 with acute urinary retention. He gave a history of bladder

tumor fulguration 2 years previously; he had had three episodes of gross hematuria since. He was chronically ill. The bladder was palpable 2 finger-breadths below the umbilicus; the prostate was slightly enlarged. Indwelling catheter drainage and slow decompression of the bladder was established. The urine was infected with mixed organisms. Cystoscopic examination showed trilobar obstructing prostatic hypertrophy. There was a papillomatous growth along the left side of the vesical neck extending from 1 to 5 o'clock. Biopsy specimens were reported as a simple papilloma. Accordingly a transurethral prostatic resection was performed on 22 December 1948, removing the prostate and tumor. Later the pathologist reported a Grade II infiltrating papillary carcinoma of the bladder. On 10 January 1949 bi-



Figure 4.

lateral ureterosigmoidostomy and a total cystectomy were performed. The convalescence was uneventful except for a superficial wound infection following a 6-day period of ileus. On 10 March 1949 he was discharged from the hospital. After operation he voided every 4 hours during the day and three times at night. The intravenous pyelograms showed a good result. On a recheck visit 6 weeks later the patient was unable to eat because of nausea and vomiting. The non-protein nitrogen was normal, but the carbon dioxide combining power was 22 vol. per 100 cc. His temperature was 101° F. The acidosis was corrected and all symptoms disappeared. He has been doing well since, receiving 15 cc. of a 25 percent solution of sodium citrate four times daily. Figure 4 is a pyelogram taken 6 weeks post-operatively.

Case 3.—E. F. L., a 30-year-old white male, was admitted on 25 September 1948. He had a history of intermittent episodes of cystitis for 3½ years. He gradually became totally incapacitated because of urinary frequency every 15 to 45 minutes day and night. The urine was grossly infected with mixed organisms. Every known therapeutic agent was employed without benefit; he required opiates constantly. Intravenous pyelograms were normal. Cystoscopic examination demonstrated a diffusely hyperemic, angry-looking bladder of small capacity. A specimen taken for biopsy was reported as granulation tissue without mucosa with a high eosinophil count. The patient refused surgery until 17 January when pain was so severe he was unable to tolerate it despite opiates. Bilateral



Figure 5.



Figure 6.—Urethrocystogram.



Figure 7.—Pyelogram 6 weeks post-operatively.

ureterosigmoidostomy was performed with a good result. On the fifth day he voluntarily discontinued all opiates. Post-operative intravenous pyelogram were almost normal. He voided about four times during the day and one or two times at night. Figure 5 is a pyelogram taken 6 weeks post-operatively.

Case 4.—W. H., a 33-year-old Negro male, was admitted on 22 December 1948. Sometime before admission he received a gunshot injury of the lower abdomen which ruptured his bladder, urethra, and intestines, and caused a comminuted fracture of the left pelvis; suprapubic and urethral drainage was done at the time of operation after injury. Upon admission only the suprapubic tube was functioning; urine was leaking around the tube. The physical and laboratory examinations were normal. Malnutrition and anemia were apparent. Bubble suction was established but only the suprapubic tube would drain. Anemia and malnutrition were corrected. Intravenous pyelograms were normal. Cystoscopic examination was impossible because the instrument could not be passed. Urethrocytogram was made (fig. 6). On 31 January 1949 bilateral ureterosigmoidostomy was performed. He was discharged on 28 February 1949 with a good result, at which time intravenous pyelograms were considered normal. On recheck 6 weeks post-operatively he was doing nicely (fig. 7). The suprapubic wound was closed but some urethral drainage was present. He voided every 3 to 4 hours during the day and three times at night.

Case 5.—T. H., a 10-year-old white male, was admitted on 10 January 1949 because of extrophy of the bladder with bilateral hydroureter and hydronephrosis. For several years the ureteral orifices were periodically dilated. One year before this admission an attempt had been made to correct the situation elsewhere but the hydronephrosis and hydroureter were stumbling blocks and the ureters were not tampered with. All laboratory studies were normal (fig. 8). On 8 February 1949 bilateral ureterosigmoidostomy of the very large ureters was performed. The post-operative course was uneventful. He was discharged on



Figure 8.—Pre-operative retrograde pyelogram.



Figure 9.—Intravenous pyelogram 6 weeks post-operatively.

5 March 1949 voiding three times at night and every four hours during the day. Post-operative pyelograms demonstrate a splendid result (fig. 9).

NOTE.—The author being an assistant in this case, the consultant, Dr. William P. Herbst, Jr., has granted permission to include it in this report.

Case 6.—T. M., a 52-year-old white male, was admitted on 1 March 1949. He gave a history of intermittent painless gross hematuria of 10 months' duration. Cystoscopic examination elsewhere showed a cauliflower mass over the left ureteral orifice. Physical examination and blood studies were normal. Repeat cystoscopic examination revealed a large quarter-sized papillary mass just above the left ureteral orifice. Tissue for biopsy was reported as Grade II papillary, infiltrating carcinoma of the bladder. A complete study demonstrated no evidence of metastasis. Bimanual pelvic examination disclosed no bladder fixation. On 11 March 1949 bilateral ureterosigmoidostomy and total cystectomy were performed. Recovery was complicated by ileus for a 12-day period. On a re-check visit 6 weeks after discharge acidosis and fever were present. The non-protein nitrogen was normal. The acidosis was corrected and the symptoms disappeared. Post-operatively he voided five or six times during the day and three times at night.

Case 7.—B. W., a 60-year-old white female, who had had many admissions to the U. S. Naval Hospital, Bethesda, Md., for carcinoma of the cervix, was readmitted on 3 March 1949 because of intractable pain. Previous radium and high voltage roentgen therapy did not control the cancer. On 1 April 1949 bilateral ureterosigmoidostomy and a colostomy were performed in spite of a nonfunctioning left kidney. Urinary drainage was provided through the proximal opening of the distal segment of the colostomy. Her post-operative course was uneventful and intravenous pyelograms showed a one-plus hydronephrosis on the right (fig. 10). This was attributed to the adverse uphill drainage. Three weeks later a combined abdominal-perineal hysterocysto-colectomy was done. The patient died from shock that night. Permission for autopsy was denied.

Case 8.—J. M., a 52-year-old white male, was admitted on 6 June 1949. He had been having recurrent episodes of gross painless hematuria for 3 months. He had no other complaints. Prior to admission his only treatment had been "pills." The physical examination was normal except for the hematuria. Cystoscopic examination demonstrated a flat, sessile tumor above the right ureteral orifice with an area of necrosis in the center. There was no fixation of the bladder on bimanual examination. Retrograde pyelograms were normal. Tissue submitted for biopsy was reported as Grade II transitional cell carcinoma of the urinary bladder. On 17 June 1949, bilateral ureterosigmoidostomy and total cystectomy were performed. The post-operative course was uneventful until the eighth day when a small amount of



Figure 10.—Post-operative intravenous pyelogram.



Figure 11.—Pyelogram taken prior to streptomycin therapy.

urinary and fecal drainage appeared at the urethral drain, but this cleared up after a few days. Intravenous pyelograms showed slight dilatation of the upper urinary tracts and pooling of the dye in the rectum. He developed a thrombophlebitis of the left leg which responded to anticoagulant therapy. Recheck pyelograms showed a good result (fig. 11). He had urinary frequency every 2 hours during the day and from three to five times at night. The nonprotein nitrogen had constantly remained normal. Some time later guinea pig studies on kidney urine, taken at the time the retrograde pyelograms were made, showed acid-fast bacilli from the right kidney. Urine from the left kidney was normal. The patient is now under therapy with streptomycin.

Case 9.—A. N. S., a 31-year-old white female, was admitted on 8 June 1949, complaining of low back pain. In 1942 she had menorrhagia which became progressively worse until 1946 when she had a miscarriage. At that time a diagnosis of carcinoma of the cervix was made. She was given a complete course of treatment with radium. In 1947 she received high voltage roentgen therapy and the following year (February 1948) a hysterectomy was done. Following this she did well until 1 month ago when severe low backache and dyspareunia developed. The physical examination was normal except for overweight and suprapubic tenderness on deep palpation. The pelvic examination disclosed a firm fixed, moderately large mass on the left side. No uterus could be made out. Roentgenograms showed no bone or chest metastases. The nonprotein nitrogen and intravenous pyelograms were normal. Colostomy and ureterosigmoidostomy were done on 21 June 1949. The post-operative course was not unusual; there was a moderate ileus. On 6 July 1949, her first post-operative pyelograms showed a moderate hydronephrosis bilaterally. During the entire post-operative period urinary drainage had been by bubble suction from the colostomy stoma. The nonprotein nitrogen remained normal. On 8 July she was out of bed for the first time and convalescing. The second stage of the Brunschwig operation was done on 14 July 1949. The patient died from shock about 36 hours post-operatively.

DISCUSSION

The post-operative complications have been minimal, the most serious being ileus noted in cases 2 and 6: both patients were operated on under continuous spinal anesthesia. Adynamic ileus is serious in these patients since dilatation of the bowel can be damaging to the anastomoses or cause pressure on the ureters, and subsequent hydronephrosis may occur. Serious wound infection often occurs in these patients; fortunately, in this series, the infections were only superficial.

The use of intravenous fluids for from 6 to 12 days also presents a serious problem. However, protein, electrolyte, and blood balance must be maintained. In spite of the ability to accomplish this, weight loss and debility become evident and hospitalization and convalescence is prolonged.

Early in the post-operative course some degree of hydronephrosis is noted. It may be on one side or the other or bilateral. By the time healing is complete and the inflammatory process has subsided this dilatation disappears. It is assumed that edema of the anastomotic site is the causative factor. After 6 weeks, however, the urinary tract appears almost normal on pyelography. In none of the nine cases was there a significant rise in the nonprotein nitrogen, indicating a good functional result. Nephrostomy and drainage were not required in any of the cases.

No patient had any difficulty in handling both urine and feces per rectum. One patient was definitely able to distinguish the difference between the desire to pass urine or feces. However, this is not generally true. Feces and urine are usually mixed during each passage. Frequency of urination was not excessive in any of the patients and, to date, no rectal irritation has been reported. As a rule there are no distressing symptoms relative to this phase of the patient's management.

No deaths occurred as a direct result of the urological surgery. However, three patients died. Two died following another type of surgery and one died 8 months after the ureteral transplants and cystectomy as a result of generalized carcinomatosis. A purulent infection of the ureter and kidney occurred in one, but no extensive hydronephrosis occurred. At post-mortem examination the hollow cavity of the urinary tract was injected with contrast media and pyelograms taken. Figures 2 and 3 demonstrate the status of the urinary tract. By injecting water with a large syringe into the upper end of the ureter the condition of the anastomoses was found to be adequate to handle any amount of fluid.

In two patients acidosis occurred in the fifth and twelfth post-operative weeks. The carbon dioxide combining power was found to be very low in both and in each, fever, anorexia, nausea, and vomiting were present. In neither case was other chemical imbalance present and immediately upon correction of the acidosis all the symptoms disappeared. It is now routine to prescribe 15 cc. of a 25 percent solution of sodium citrate four times daily for all patients having had ureterosigmoidostomy. Under this treatment there have been no recurrences of the acidosis.

The cause of acidosis after ureterosigmoidostomy has not been ascertained. Nesbit and his group are carrying out exhaustive studies in

this regard. It is surmised that some absorptive mechanism is involved whereby the colonic mucous membrane absorbs acid radicals in the urine.

The method of ureterosigmoidostomy described has much to commend it. It makes possible the handling of a variety of cases without fear of the heretofore serious complications. The elliptical end-to-side principle is not limited to uretero-intestinal anastomoses. Excellent results are obtained when it is applied to the pathologic conditions found at the ureter-pelvic junction in cases of hydronephrosis. In this respect severance of the ureter and reinsertion into the pelvis exactly according to the technique described is done. There is no reason to doubt the efficiency of the principle when applied to ureterovesical connections.

SUMMARY

1. Nine additional cases of bilateral ureterosigmoidostomy by the elliptical end-to-side technique are reported. The technique based upon a sound principle in physics applied to human physiology is certain to enjoy considerable popularity because of its good end results.

2. The pre- and post-operative management, complications, and surgical technique are discussed and indications for this type of surgery are reiterated.

3. Elliptical end-to-side connections can also be used to reinsert the ureter into the renal pelvis and urinary bladder.

NOTE.—Since this article was written two additional cases, one a Grade II, and the other a Grade III carcinoma of the urinary bladder, have been handled as described in this article with excellent results. Differences between the post-operative pyelograms and the pre-operative films were difficult to detect.

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Experiences With the Marrow Nail Operation According to the Principles of Kuentscher¹

Fractures of the Humerus

PART IV

PROF. DR. C. HAEBLER

Osteotomy nailing of obliquely united fractures

FRACTURES of the humerus seldom unite in such bad position that the function of the arm is seriously affected. In most cases the patient will return for treatment before bony union develops.

Only three osteotomy nailings were done and these were necessary because of marked angulation. Our records of former cases show only four osteotomies; two were corrected with Lane's plates, and two with wire sutures.

As far as these few cases allow a comparison, it can be said that the marrow nail does not essentially further bony healing.

Marrow nailing should be given preference in all cases where the fracture is more than 7 centimeters from the joint and where a stabile osteosynthesis can be secured. The nail facilitates treatment, because a plaster cast will be necessary for only 2 or 3 weeks, if at all, and the patient will be able to move the joints early, and, as in fresh fractures, the stay in the hospital and period of unemployability are considerably shortened.

As shortening of the humerus is of little consequence with regard to the function of the arm, the fracture ends should be resected far enough to open the marrow cavity and freshen the fragments in the shape of a staircase in order to secure large abutments.

We are of the opinion that an additional wire suture is unnecessary. As a rule there is already a shortening and the muscles have con-

¹ Translation prepared by the U. S. Naval Technical Unit, Europe (Medical Section), Office of Naval Advisor, Office of Military Government (U. S.), edited by U. S. NAVAL MEDICAL BULLETIN.

tracted accordingly, so there will still be enough tension after the freshening of the bone ends to hold the fragments together. The tension was sufficient in all three of our cases.

Old fractures and pseudarthroses

In peacetime surgery we rarely see fractures of the humerus that are in such bad position that bony union is not secured; the same is true with nonunion; but even in civilian practice during wartime, we have seen a surprisingly great number of such fractures. The reason for this, in most cases, was faulty treatment such as imperfect reduction or inadequate fixation.

Closed marrow nailings of old fractures of the humerus in faulty position may be performed up to 6 weeks after the injury if the fracture is thoroughly mobilized before nailing and if a wire extension is used for 8 days, in cases of shortening. If this is done nailing will have the same advantages as are obtained in fresh fractures.

Fourteen fractures healed uneventfully and without any impediment of the joints. The average stay in the hospital was 32 days and average unemployability was 73 days.

Of the 55 old fractures of the humerus that we nailed with exposure there was only 1 case (a fracture 5 years old) of pseudarthrosis. In all of the other cases the fracture ends were covered by connective tissue. A distraction of the fragments was the cause of all of the ununited fractures.

Five patients with fractures 8 to 12 weeks old could be observed for only 3 to 4 weeks after the operation so no report can be made as to the final results. Eight other patients whose fractures were from 2½ to 4 months old were treated as out-patients after their discharge. Distinct callus formation could be observed after 6 to 10 weeks. Bony union was expected in these cases, although the final results could not be checked.

Thirty-seven of the remaining forty-two cases showed bony union with full mobility of the joints. The stay in the hospital was from 21 to 89 days, an average of 47 days, and unemployability was from 74 to 168 days, an average of 108 days.

In case of a pseudarthrosis the removal of the newly formed cartilage surface together with fixation is not sufficient to achieve union. This seems rather surprising at first when we think of an arthrodesis of a joint in which the cartilage is removed. Furthermore we have seen that in many ununited fractures a stabile osteosynthesis without resection of the bone assures full success. The author had this fact in mind when he abstained from performing resection in a pseudarthrosis of the humerus in which the radial nerve was embedded in the

new joint capsule and passed proximally through the callus in which remnants of a former wire suture still lay. The operation was performed in such a manner that the least possible damage was done to the nerve.

There is a distinct difference between a true joint and a pseudarthrosis. Below the thin intermediate lamella of the true joint (which will always be removed) lies sound spongiosa with good blood supply and cells containing marrow which can stimulate bone regeneration; but below the cartilage of pseudarthrosis we find a thick layer of eburnated bone which is free of marrow and unable to act as stimulus to bone regeneration only when this bone undergoes lysis. This is observed in almost any united fracture as it is a source of minerals necessary for calcification of the bone. It takes place in the presence of local acidity, and develops in the first phase of reparative inflammation of the wound and fracture healing, but subsides in a short time in an aseptic course.

In ununited fractures the fragments are frequently covered by eburnated bone, but in such cases the periosteum is separated from the bone and will initiate callus formation. The decomposition necessary for calcification takes place in the subperiosteal part of the bone which is easily diffused and is rich in blood cells. This is not the case in eburnated bone. It must also be borne in mind that the scar tissue readily dissolves and is thus prepared for a deposit of minerals. This tissue changes to fresh connective tissue which is subject to metaplastic bone formation. If, in case of pseudarthrosis, the cartilage is resected within the capsule without separating the periosteum, a periosteal neoformation of bone cannot take place. It is therefore necessary, in pseudarthrosis, to resect the fracture ends far enough so that sound bone is exposed and so the periosteum can then form callus.

In an 8-week-old fracture (fig. 71*a*) a thin nail had been used that was too short. It can be seen from figure 71*b* that the nail had considerable play in the proximal marrow cavity. Four weeks post-operatively the patient began to exercise the arm but complained of pain. Three months after the operation it was noticed that the fracture was movable so a plaster cast was applied for a short time. It was not observed that the fracture was distracted (the nail had slipped out of the marrow cavity) (fig. 71*c*). A plaster cast up to the shoulder was applied instead of a thorax-arm-abduction cast, but the fracture ends were not pressed together. Five months after the operation the nail had angulated in the fracture cleft (fig. 71*d*), because the patient had subjected his arm to exercises for 6 weeks. The fracture was still distracted and ununited. In spite of this the patient continued to exercise his arm. Eight months after the operation (after the removal of the nail), a pseudarthrosis was observed (fig. 71*e*). A graft from

the tibia was made and the arm immobilized in an abduction cast, and 8 weeks later the fracture had healed.

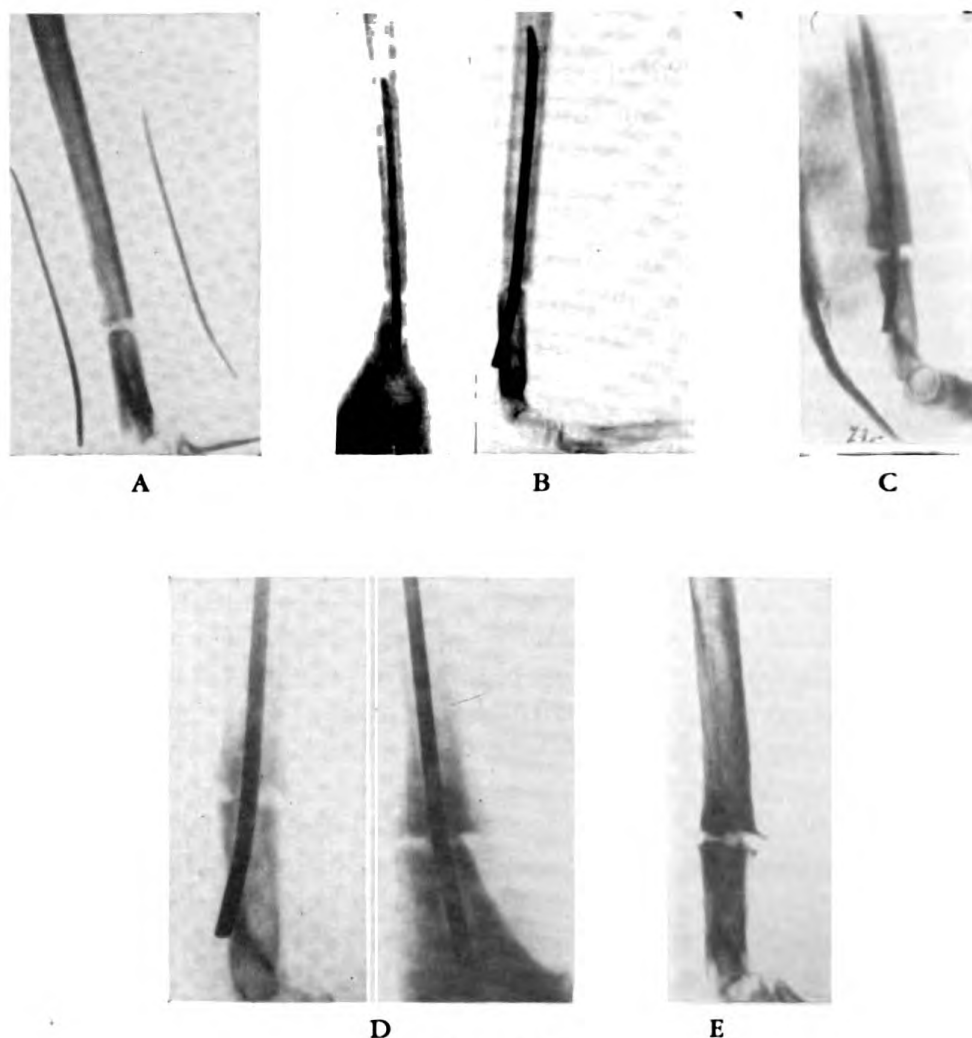


Figure 71.

If the fracture had been immobilized by an abduction cast at the beginning, or had the fracture been pressed together after the distraction had been observed, a faulty union would have been avoided.

Figure 72a is a 10-week-old ununited fracture of the humerus after nailing. There was marked atrophy of the bone because of previous immobilization of the limb in a plaster cast. The fracture was angulated and the displacement amounted to $1\frac{1}{2}$ times the width of the shaft. The inner nail only could be used because the marrow cavity was very narrow. The nail was driven into the spongiosa of the head, thus securing a stable osteosynthesis. Fourteen days post-operatively the patient began to exercise the arm and experienced no pain. Three weeks after the operation the patient was released from the hospital

for ambulatory treatment and he was able to resume work 6 weeks post-operatively.

Six months after the operation there was bony union (fig. 72*b*). All joints were movable and the nail was withdrawn.

Nonunion could have been avoided if double nails had been used or if the distraction had been noticed and the fracture ends pushed together and the arm immobilized in a plaster cast.

Similar conditions prevailed in two other fractures 5 to 6 months old, which had been treated outside our clinic. In these cases only one short nail was used, distraction was not observed, and immobilization was omitted, although the patients complained of pain when exercises were instituted.

The nail in position seems to have a suggestive influence; all interest centers around the nail and callus formation; distractions, changes of position, and distortions are overlooked. Because of the desire to take advantage of the possibility of early movement of the joints because of a stabile osteosynthesis, the principles of bone surgery are completely disregarded, namely that the fracture must be put absolutely at rest and only such movements that do not cause pain are permissible.

The author fell prey to this suggestion while treating a case in his special ward. A simple fracture of the humerus slightly below the middle, was treated for 10 months with a plaster cast and abduction splint. The fracture would not unite because of the continuous displacement of the fragments. It was then nailed (fig. 73*a*) at another hospital, but the nail was too short and did not find sufficient hold in

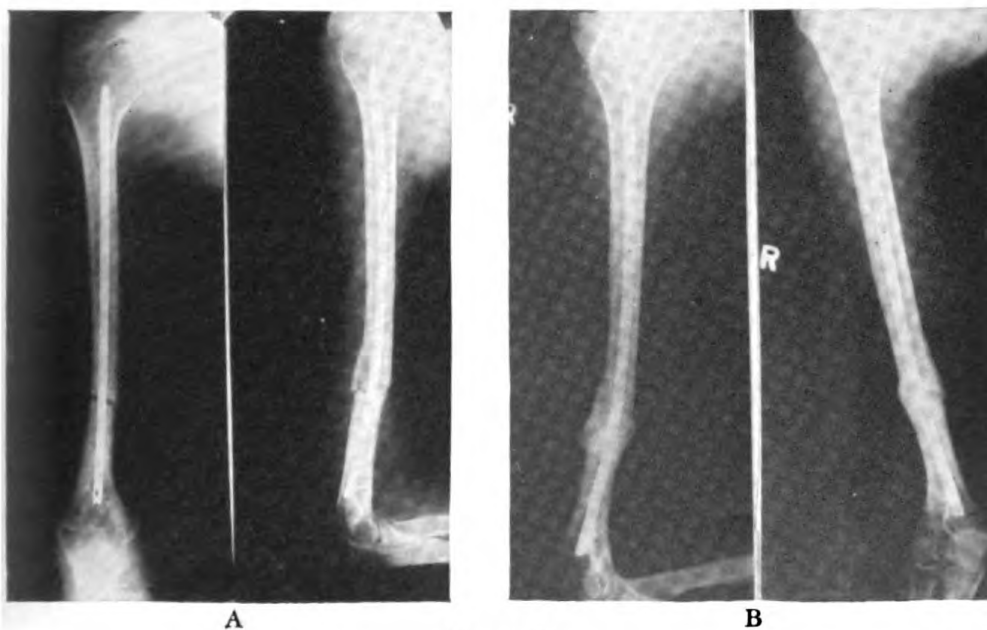


Figure 72.

the proximal marrow cavity. A distraction of the fragments which had not been pushed together could be observed. The plaster cast was removed 8 weeks later and the limb moved in the abduction splint. Three months later the patient was brought to another military hospital where it was discovered that distinct valgus position and crepitation existed (fig. 73*b*). In spite of these findings exercises were continued. Five months after the operation the patient felt a slipping at the fracture site and a roentgenogram (fig. 73*c*) revealed an increased angulation of the fracture and the nail. The fracture was then reduced under anesthesia and a plaster cast applied, which was left in position for 4 weeks, after which the patient again began exercises in the abduction splint. Nine months post-operatively, when the patient was admitted to the special ward, the fracture was still movable. A roentgenogram (fig. 73*d*) revealed a pseudarthrosis and a broken nail. The pieces of the broken nail were removed and the ends of the fracture were conservatively freshened (a dorsal callus spicule was intentionally left in position) and two longer nails were introduced distally. The fact that the marrow cavity of the proximal fragment was very wide was overlooked. The nail should have been driven farther into the spongiosa of the head (fig. 73*e*). The fracture was apparently fixed after the nailing, therefore, only a U-splint and sling were applied. Exercises of the shoulder and elbow joints were started 2 weeks after the second operation and the U-splint was removed 6 weeks post-operatively and a roentgenogram made. The deputy chief surgeon, who was in charge, was under the impression that a callus bridge had

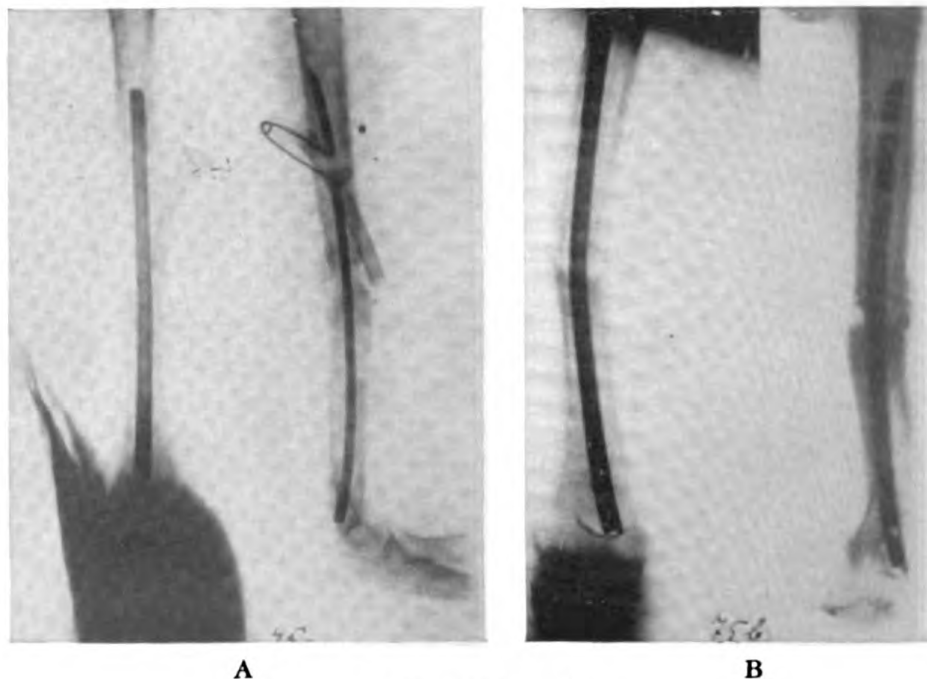


Figure 73*a* and *b*.

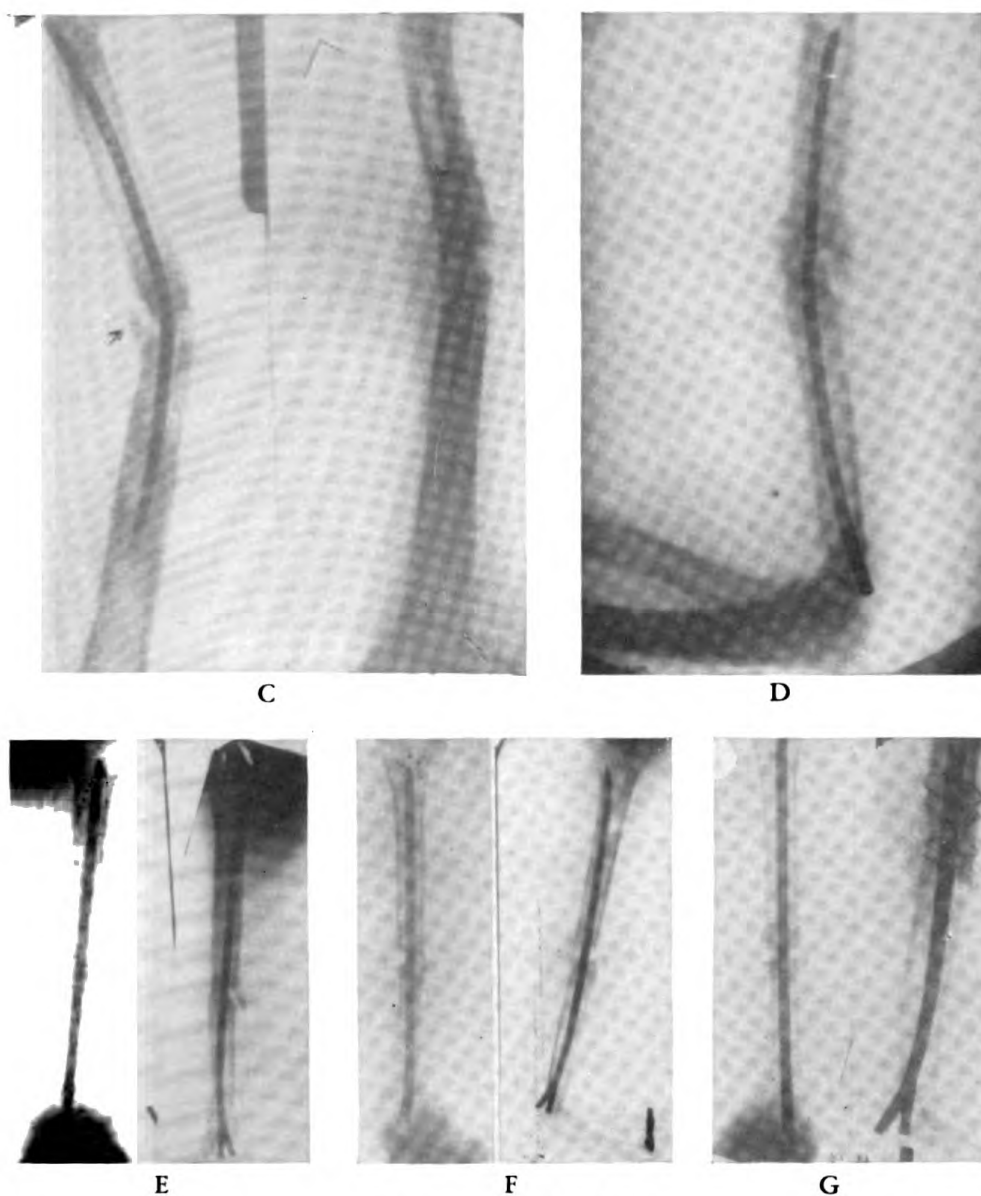


Figure 73c, d, e, f, and g.

formed at the posterior and inner sides (fig. 73f) so the arm movements were made without a bandage.

It was not noticed that the fracture was distinctly distracted and that the alleged bridge was not a new callus formation but was the bone spicule which had been left in position. Within 8 days the patient complained of pain so a cast was applied, but the fracture ends were not pushed together. Two months later, when the plaster cast had been removed, the author bridged the pseudarthrosis with a graft and the nail left in position. The bone ends were freshened, the frag-

ments pushed together, and the tibia graft fastened with wire loops (fig. 73*g*). In spite of the abduction cast distraction of the fragments developed because the distal wire loop had slipped off the slightly tapering bone end. This was overlooked when the patient was seen by the author 3 months after the operation (fig. 73*h*) and exercises were instituted. Five months after the operation the fracture, though resistant to bending, permitted rotary movements and the roentgenogram (fig. 73*i*) revealed that the bone graft was connected to the proximal fragment only.

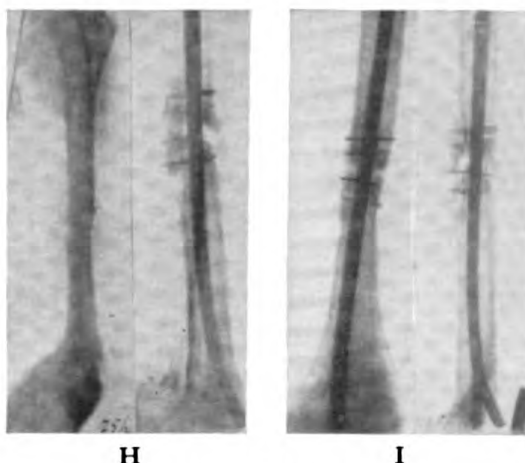


Figure 73b and i.

The fracture was distracted and the pseudarthrosis recurred. The patient was discharged from the hospital because of war conditions but later reported that he had used a hinged splint and the nail broke again. The nail was removed and a new bone graft performed but this also was unsuccessful.

There is no doubt that several technical mistakes were made in this case. First of all a double nail long enough to have a good grip in the spongiosa of the head should have been used in the beginning: because of the wide proximal marrow canal the fracture should have been nailed from above. The author failed to correct this mistake when the second operation was performed, instead another nail that was too short was inserted. If the fracture ends had been fixed by wire suture a new distraction would have been prevented. During the bone graft operation the nail should have been replaced by a longer one, and most important of all the nails should have been led through the bone to prevent slipping off.

Boehler recommends an additional longitudinal wire suture in all old fractures of the humerus, but one objection to this is the danger of the suture cutting the bone in case of bone atrophy. The author

considers the wire suture necessary in exceptional cases such as very old pseudarthroses. Bone atrophy does not constitute a definite contra-indication to marrow nailing unless it is too far advanced. Breaking of the nail is hardly expected in the humerus because the lateral strain is not so strong. In case of an atrophic bone the fracture of the humerus can be nailed from above and the nail driven very deep into the distal epiphysis so as to be firmly engaged and thus make distraction impossible. This was proved in the case of a 4½-month-old fracture of the humerus which had been treated at another hospital. Callus formation had not been obtained. A marked proximal bone atrophy was observed after the open nailing operation (fig. 74a). The nails forged a stabile union with the distal spongiosa and the patient began exercising the arm 10 days later. He was released from the hospital for ambulatory treatment 18 days post-operatively. Six weeks after the operation the patient had full use of his arm; no distraction was observed and callus had begun to form (fig. 74b). Two and a half years after the operation the fracture had entirely healed (fig. 74c), the joint was freely movable, and the nail was removed.

Figure 75a is a 1¼-year-old ununited fracture of the humerus that had been treated primarily with a wire suture and became infected. The wounds had been healed for 8 weeks when the roentgenogram was made. There was marked atrophy, particularly of the proximal fragment. During the nailing operation only the connective tissue was removed. The bone was so soft that it could be cut and the mar-

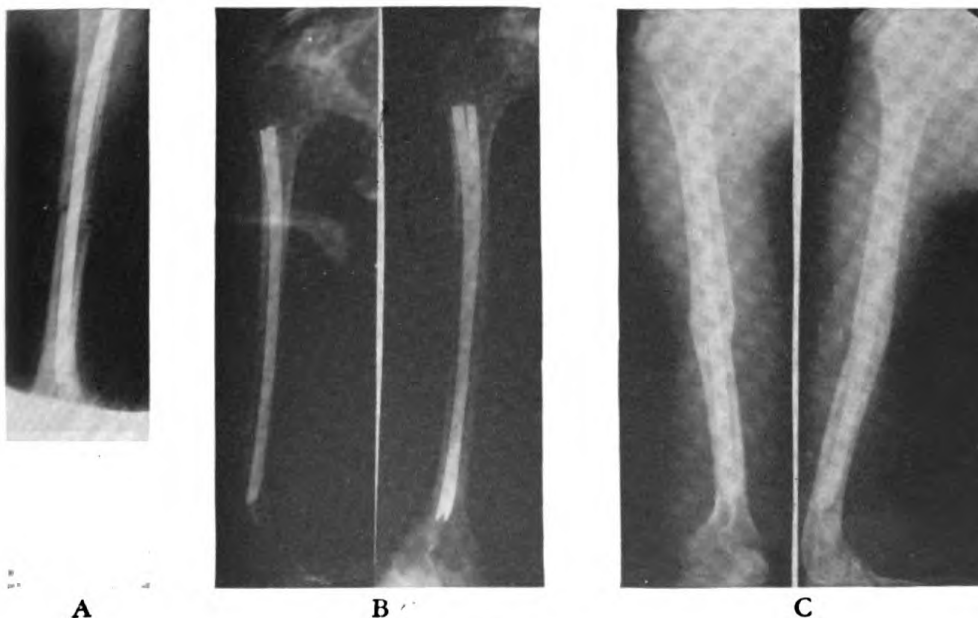


Figure 74.

row cavities easily located. Figure 75*b* is the same fracture after nailing. The arm was put in an abduction cast and the elbow was subjected to exercises. After 8 weeks the upper arm was subjected to exercise and the cast removed after 12 weeks. The nail was removed 4 months after the operation; the fracture was united (fig. 75*c*).

It is very important in these cases to leave the abduction cast on long enough (particularly in cases of atrophic bone and musculature) and that the arm be carried above the horizontal in this plaster cast, a requirement often disregarded. After 3 or 4 weeks the part of the cast next to the forearm may be removed to permit free movement of the elbow, the rest of the cast should be left in position for at least 8 weeks and then removed only if arm movements are painless and roentgenograms reveal distinct callus formation.

If one is not overenthusiastic about the nail and if the danger of distraction (especially if the nail was introduced from below) is borne in mind, the fracture will usually unite.

We show by one more example that a stabile fixation of the fracture is the most important factor in obtaining final healing. This case is particularly interesting because the healing was achieved with a nail that was too small. This was a compound fracture of the humerus complicated by a small skin wound in the distal third. The nail used was too thin and much too short (ulna nail). The wound healed primarily but the fracture was still ununited after 8 months' treatment in a plaster cast (fig. 76*a*). The author suggested that the fracture be exposed, the fracture ends be freshened and the fracture nailed with a properly dimensioned nail. This was done except that an

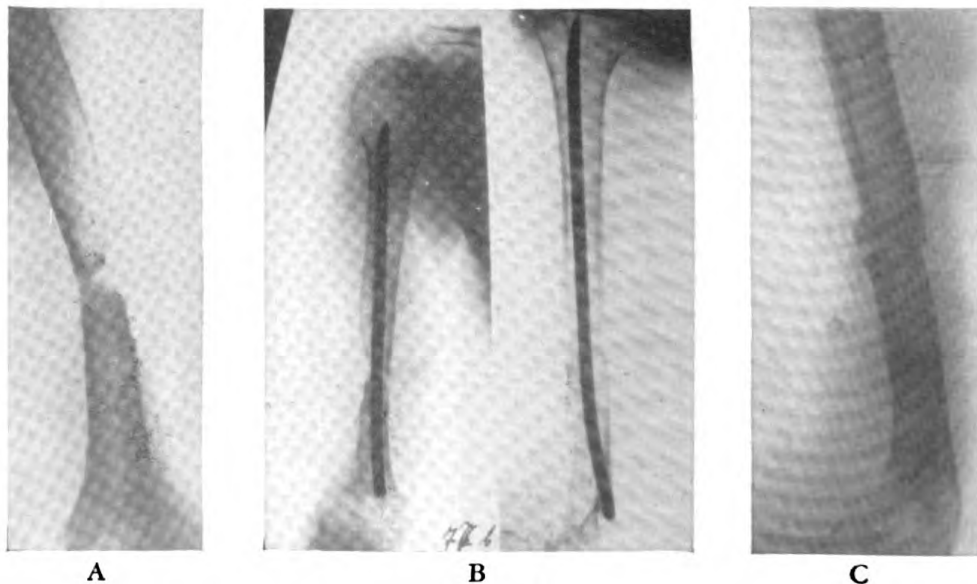


Figure 75.

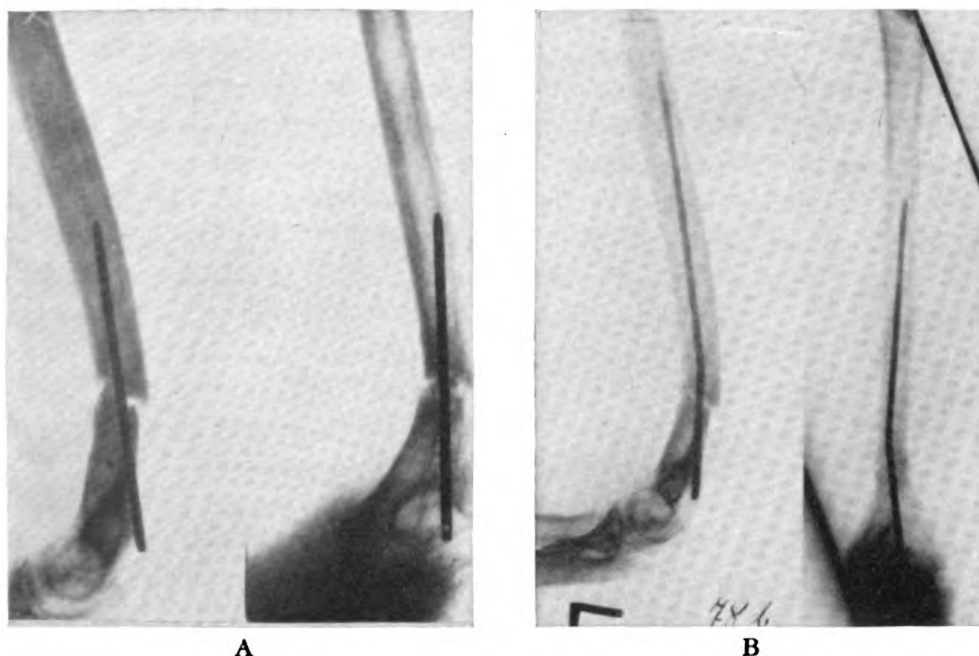


Figure 76.

ulna nail was used which was too small. Nevertheless, the nail jammed in the marrow cavity because it angulated at the fracture site. In this way the osteosynthesis became stabile despite the fact that the nail was too short and too thin. The arm was put in a plaster cast for 10 weeks. The patient was able to move his arm 5 weeks after the operation and when he was admitted to our special ward 6 months after the second operation the fracture had united (fig. 76b) and the nail was withdrawn.

On the strength of these results (despite accidents due to technical mistakes) we feel that we cannot agree with Boehler and we are of the opinion that the treatment of old fractures and pseudarthroses of the humerus are best treated with the marrow nail provided a stabile osteosynthesis can be secured.

FRACTURES OF THE RADIUS AND ULNA

Osteotomy nailing of fractures united with angulation

The rotary movement of the forearm is greatly hampered and the use of the hand greatly reduced if a fracture of both bones of the forearm unites in faulty position. Old osteotomy methods were not satisfactory in this type of fracture and the bones are not thick enough for proper use of Lane's plate. The improper technique in the use of a Lane's plate may have an obstructive effect and delay healing of the fracture. If wire sutures are used the cut must be made on a very acute angle to permit the use of several sutures be-

cause when only one suture is used on a short cut it must be drilled through the bone creating a hazard of new displacements. Thus the marrow nail presents special advantages in this type of fracture. The author used the marrow nail in six osteotomies of radius and ulna in which both bones were nailed.

No infections occurred in these six osteotomies. A plaster splint was used in all cases and the patients began to move the limbs after 8 days. Splints were removed in 2 to 4 weeks and after 4 to 5 weeks the patients were able to make full use of their arms and perform their duties as usual. The advantage of marrow nailing over the old osteosynthesis methods is quite obvious.

It is necessary that the fractures be located far enough away from the joints to secure a stabile osteosynthesis. An atrophic bone should not be nailed because of the danger of perforation by the nail. Marrow cavities must be wide enough to permit the use of the thin nail.³

Both bones should be severed at the old fracture site if possible. Next, the ends of the ulna should be freshened (always at a slant or staircase shape) until they can be brought in good abutment and then fixed with Lambotte's bone forceps. The radius is then put in proper position and the results checked by roentgenogram, particular attention being paid to a possible luxation of the radius in the distal radio-ulna joint. The necessary corrections can be made at this time and as soon as the bone ends are brought in perfect position they are nailed (the ulna being nailed first because the nail may be driven in through the olecranon with its eye anteriorly). The radius is nailed the same as simple fractures. If the bone ends do not abut properly before, nailing conditions may arise similar to those shown in figure 77a.

In one case the ulna was nailed in satisfactory position after osteotomy, but while nailing the radius it was discovered that there was a gap in the ulna so the nail was withdrawn and the bone resected. Due to a bony projection the fracture planes could not be brought into broad contact (both bones should have been more thoroughly resected). This is not very important in itself, but if the nail is too short, as was the case in this instance, obstructions and tilting movements of the fracture cleft may develop and prevent healing. The nail will move in the bone and may break through the cortex as shown in figure 77b. A periosteal deposit of new bone will take place in aseptic healing; this will not cause any serious trouble, but the nail will have to be removed early (fig. 77c).

³ The author does not approve of "inner splinting," using Kirschner wires because of his experience in treating fresh fractures. The simple wire is too elastic to prevent lateral movements which will result in a faulty union.

Old fractures and pseudarthroses

Satisfactory results in the treatment of fractures of the forearm more than 1 week old by the closed nailing method are doubtful. The author treated no cases of this type.

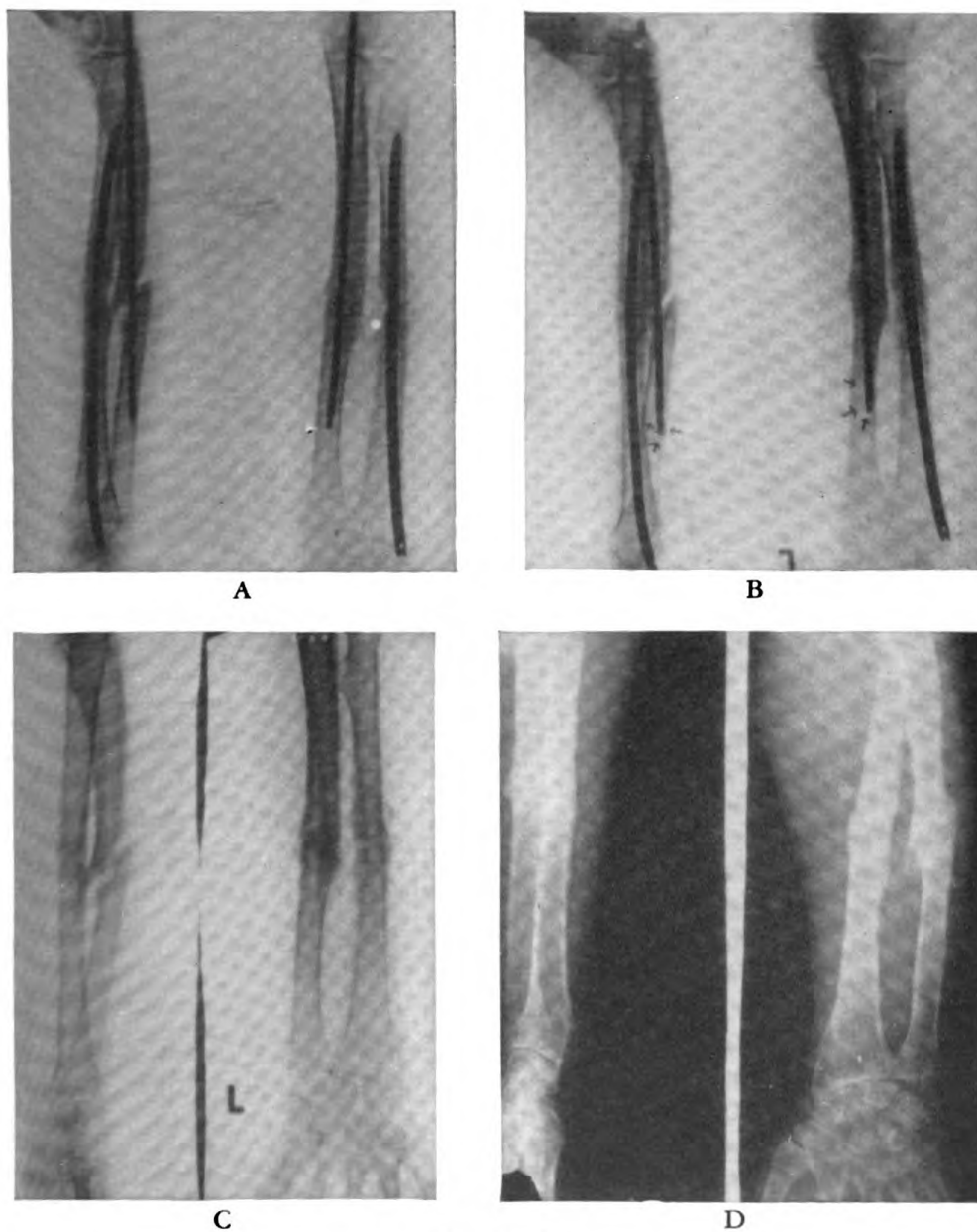


Figure 77.

Of the 23 fractures nailed with exposure of the fracture site, 15 were up to 3 months old and would have united had the old conservative method been used. All resulted in a bony union with the nail.

There were no cases of isolated fracture of the shaft of the ulna treated by the author and only one case of isolated fracture of the shaft of the radius. The nail was removed after 2½ months.

An infection occurred in 4 of the 14 fractures of both bones.

In one case an infection developed at the entrance site of an ulnar nail which could not be driven in far enough and had to be cut off. Inflammation developed because of the failure to smooth the sharp edge of the bone. When callus formation became clearly visible at the fracture site after 5 weeks, the nail was removed. An abscess developed at the fracture site 8 days later (the arm was not elevated after removal of the nail). Eighteen days after drainage of the abscess a small sequestrum was ejected, after which the wound healed and the fracture united; full function of the limb was obtained. The osteosynthesis was stable in this fracture.

In the following case the fixation was incomplete. In this fracture only the ulna was nailed, the nail being driven in slightly more than 2 centimeters (fig. 78). The point of the nail entered the cortex

and when the nail was withdrawn 3 months later a marginal sequestrum was ejected, after which the wound healed. As the fracture was in good position and the plaster cast was left in position long enough, full use of the limb was regained.

The results were very unsatisfactory in the following cases because of improper technique.

In an 8-week-old fracture only the radius was nailed from near the head. The fracture ends were resected, but the surgeon failed to resect the ulna at the same time; thus a defect of about 5 mm. developed in the radius (fig. 79a). The wound became infected but it was widely opened in time and the limb immobilized, thus avoiding an extension of infection to the bone. A luxation of the distal radio-ulna joint developed and the final result was a pronation position of the arm with considerable impediment of outward rotary movement of flexion of the wrist joint (fig. 79b). The radius would not have healed but for the



Figure 78.

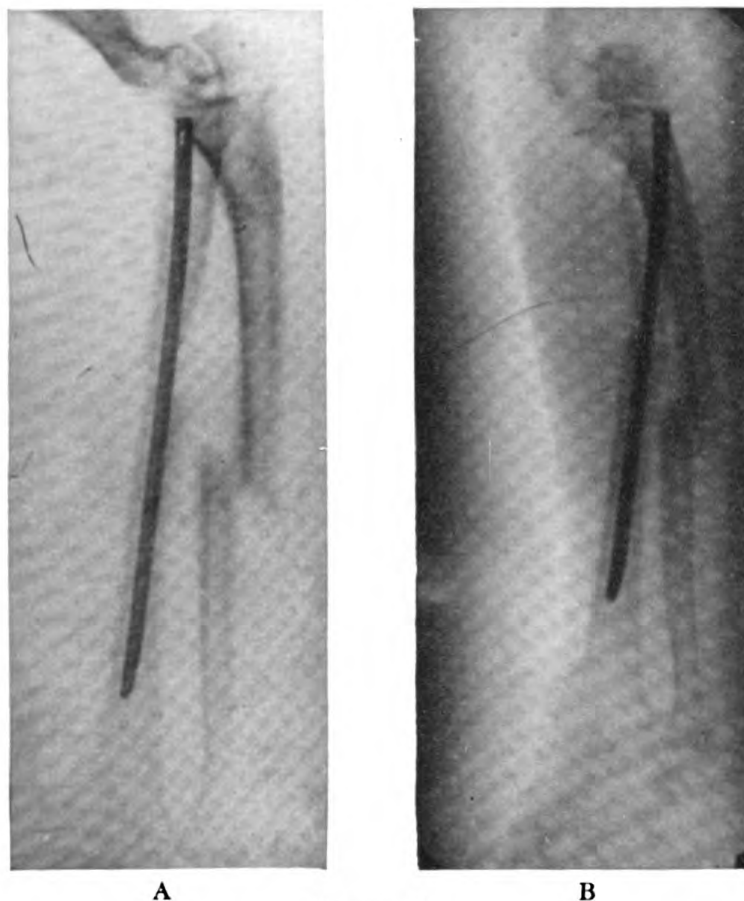


Figure 79.

distal luxation which permitted the radius fragments to come in contact.

Figure 80a is a roentgenogram of a 9-week-old fracture of the forearm. The first mistake in this case was made in determining the length of the nail; the second mistake was that the nail was applied the wrong way and a radius nail was used for the ulna. The nail was too narrow for the proximal marrow cavity of the radius. The marrow cavity was split when the nail was forced into it and it was not noticed that the nail was no longer in the bone. For fear that the same thing might happen to the ulna it was "nailed" with Kirschner wires (fig. 80b), although nailing with a thin ulna nail would have been possible. Nothing was achieved in this case by nailing as the fracture shifted in the cast and had to be corrected several times; severe swelling and blebs developed while the arm was in the plaster cast due to insufficient reduction and fixation of the fracture. When the patient was admitted to the special ward 5 months after the operation the wounds and fracture had healed. The roentgenogram (fig. 80c) revealed a displacement of about the width of the shaft and a slight angulation. The result was complete impediment of the rotary

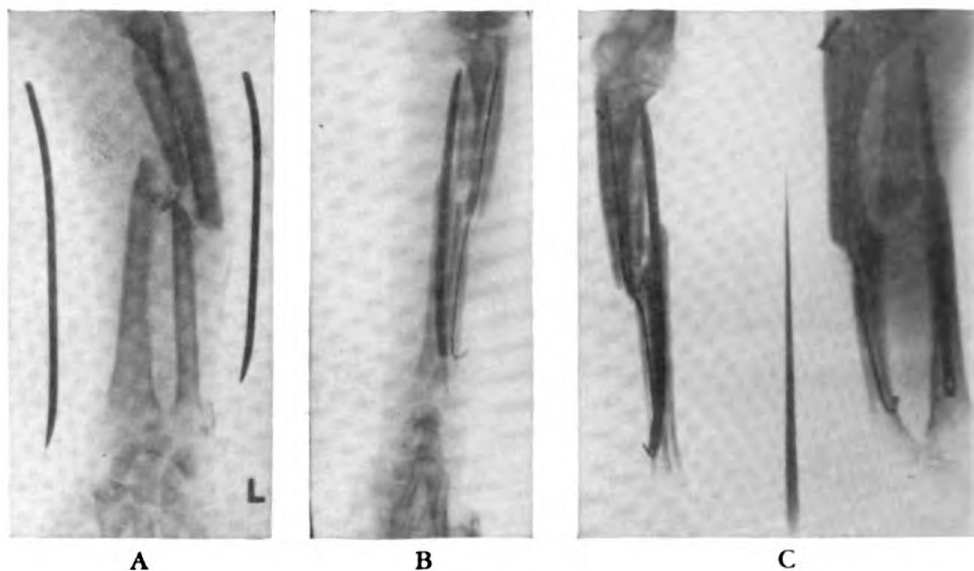


Figure 80.

movement, a limitation of mobility of the wrist by about 50 percent, and of the elbow by 90°.

It must be admitted that both of these fractures would have healed quicker and presumably with better results under conservative methods; but the marrow nailing method cannot be blamed for these failures. If suitable nails were not available the operation should not have been performed.

The bone ends should not be resected if the fracture is less than 3 months old, as the best abutment of the two bone ends is guaranteed if they are not resected; the marrow cavities are easily located. It is recommended, however, to proceed in the same manner as in osteotomy—reduce both bones with Lambotte's bone forceps before the nails are driven in. The author saw one case where there was a defect of the radius of several millimeters although nothing had been resected. In such cases it is necessary to shorten the second bone accordingly in order to secure a wide abutment. A faulty union is imminent if a wide abutment is not obtained.

If proper technique is used the results obtained by nailing old double fractures of the arm will be good. Ten such fractures united in good position without any impediment with an average stay in the hospital of 56 days, unemployability averaged 115 days.

Nailing of old forearm fractures has definite advantages, but it is absolutely necessary that there be a stabile osteosynthesis and this is possible only if both bones are nailed. Because of the danger of infection this operation should be performed only if satisfactory reduction by conservative methods cannot be obtained or if there is no callus formation observed after 3 months.

Accurate approximation and fixation of the bone in fractures over 4 months old is necessary. If there is a pseudarthrosis or if the development of a pseudarthrosis is imminent it will be necessary to freshen the fracture ends.

The most favorable conditions prevail if there is no healing of the two bones. In this case the ends of the fracture can be brought together in such a way that there is a wide abutment and if the nails are sufficiently long a stabile osteosynthesis is guaranteed. The technique in this case is the same as is usually applied in osteotomies.

Figure 81*a* is a roentgenogram of a 5-month-old fracture of the forearm. Three weeks after the injury the radius and ulna were exposed and the ulna was fixed by means of a wire loop. When the plaster cast was removed 4 weeks later it was discovered that the loop had slipped and that the entire fracture was not stabile. Both bones were then nailed by the open method and a stabile osteosynthesis secured (fig. 81*b*). The patient was released to his unit 4 weeks after the operation.

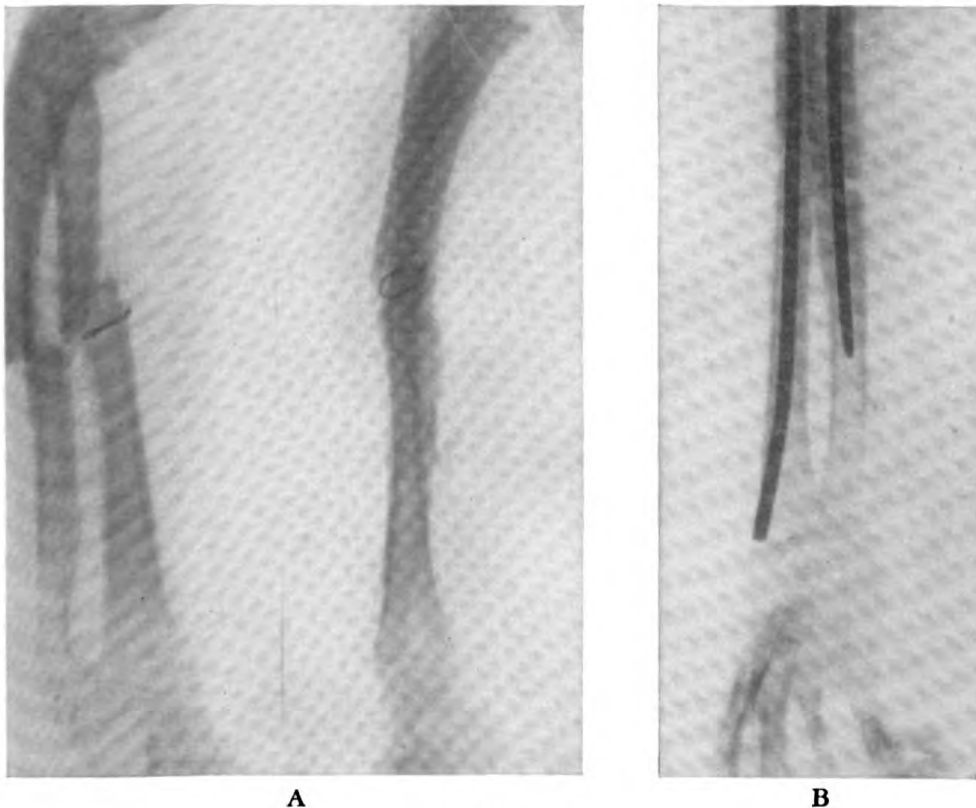


Figure 81*a* and *b*.

Eight months after the operation the fragments had united (fig. 81*c*) and rarefactions around the nails could not be observed. Figure 81*d* is a roentgenogram made after the nails were removed.

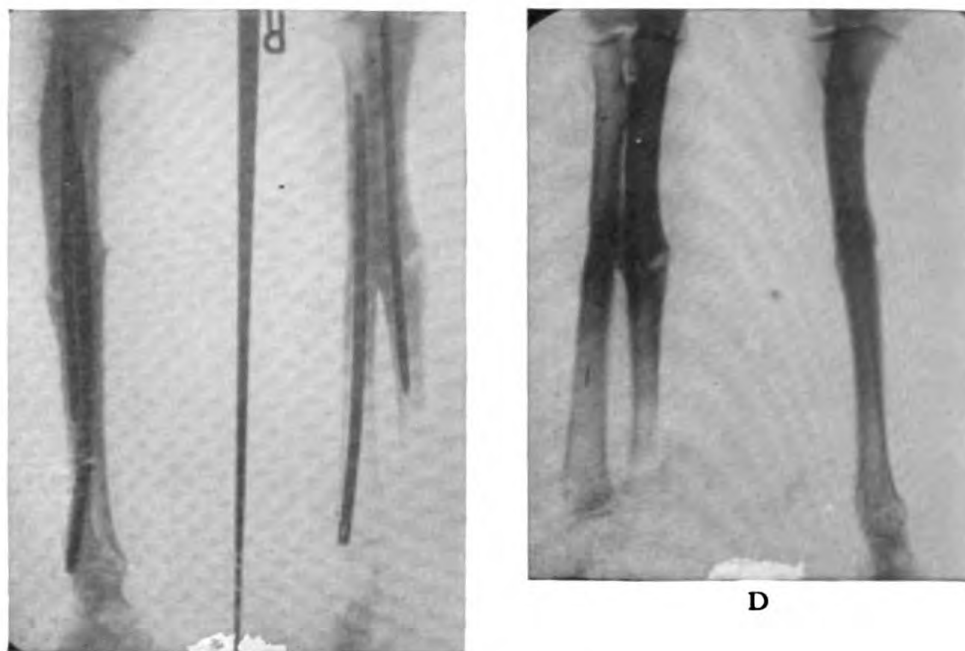


Figure 81c and d.

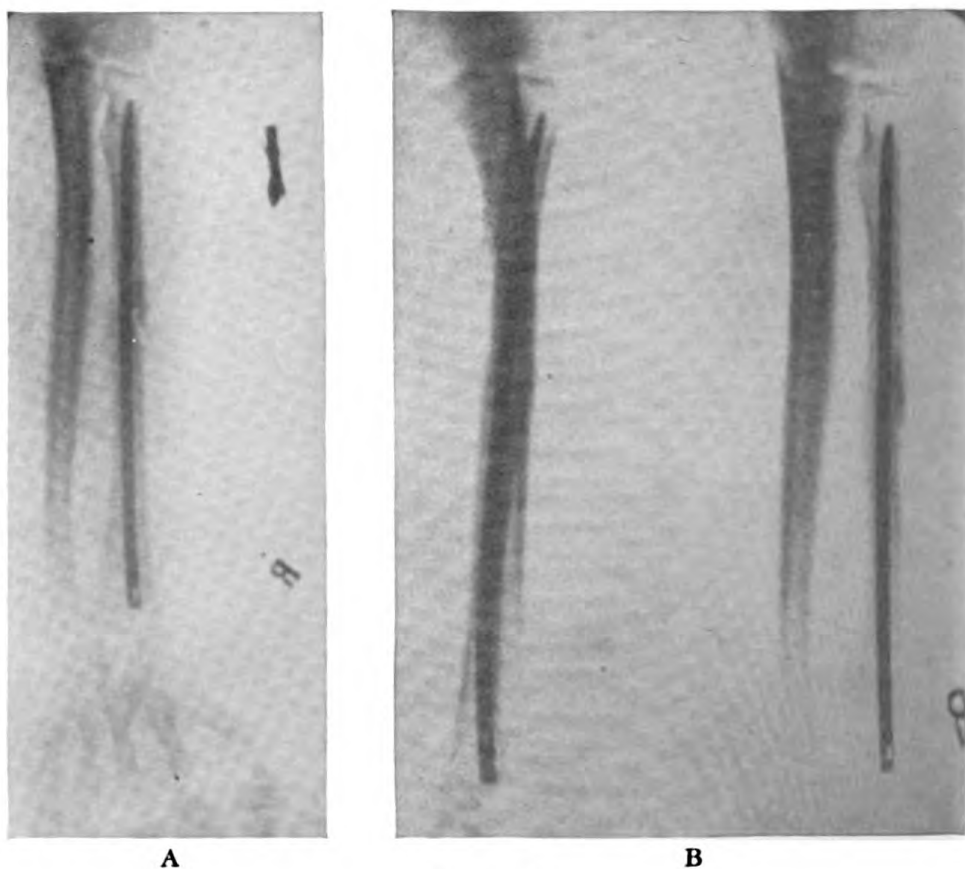


Figure 82.

If a pseudarthrosis exists in only one bone a wide and positive abutment of the bones can be obtained in oblique fractures only.

When the fracture site is sparingly freshened obliquely, a positive abutment can be achieved if conditions are favorable and the nail used is long enough.

The author was successful in two operations of 5- to 7-month-old ununited fractures of the radius. One case was a 5-month-old oblique ununited fracture of the radius in which only the scar tissue between the ends of the bones was removed (fig. 82*a*). Ten weeks after the operation most of the fracture cleft was bridged over (fig. 82*b*). The nail was removed 4 weeks later.

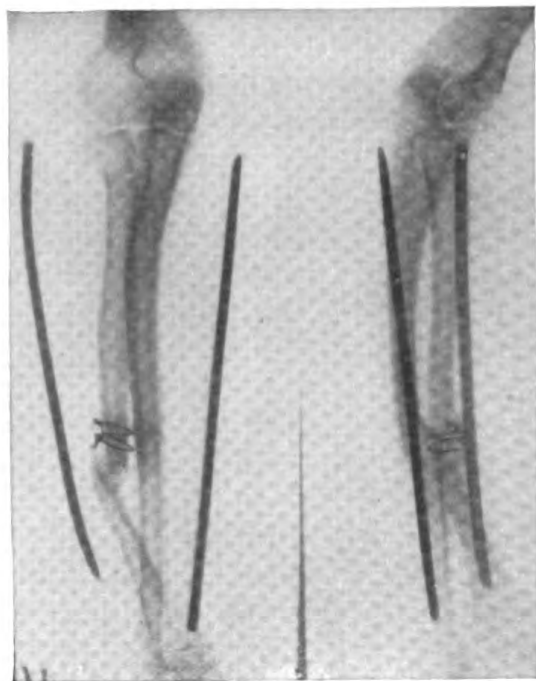
When the fracture ends do not firmly abut and the nail used is too short or a Kirschner wire is used for nailing, a faulty union is unavoidable.

There is also the danger that the sound bone will prevent the union of the resected bone in case of an ununited fracture. The only solution in a case of this kind is to resect the sound bone and use a marrow nail.

The author used this procedure in all cases except in old gunshot fractures. In one case, a year and a half old pseudarthrosis of the radius (fig. 83*a*) a bone graft had been made 9 months previously, which, due to infection, led to the ejection of the graft and resulted in a faulty union. The marrow cavity was so narrow that an ulna nail had to be used. This nail became so firmly engaged in the cavity that a shorter nail had to be substituted. A short nail also had to be used for the ulna because of the age of the fracture. Consequently the fracture was movable in an axial direction after nailing and osteosynthesis was not stable (fig. 83*b*). An infection and formation of sequestra which developed at the fracture cleft of the radius caused a luxation in the distal radio-ulna joint and a movement of the radius nail (fig. 83*c*). The final result was a pseudarthrosis with luxation at the distal radio-ulna joint, a condition worse than that existing before the operation. This poor result was due to instable osteosynthesis and infection. The danger of infection and other complications which ensue in such cases when old fractures of the forearm are treated with the open marrow nailing method must be seriously considered.

For the same reason we do not resect a corresponding piece of bone from the second bone for the purpose of inserting it into the defect with the marrow nail. We deem this method more hazardous than a bone graft.

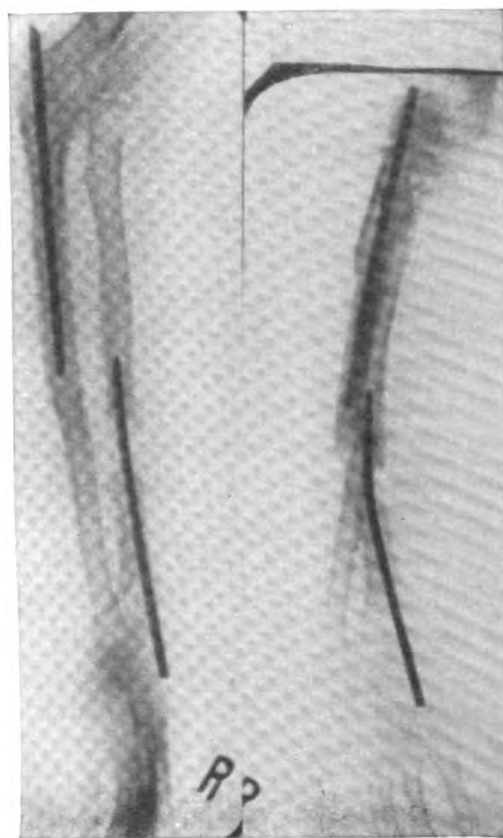
In consideration of these facts we have refrained from nailing isolated pseudarthroses of the bone in the forearm if a proper abutment of the fracture ends cannot be obtained. In these cases we use a graft from the tibia; in seven cases we achieved a bony union.



A



B



C

Figure 83.

SUMMARY

The danger of infection of the fracture cleft is considerably greater in open than in closed marrow nailing.

Long duration of operation, improper technique, and especially an unstable osteosynthesis are the principal causes of infection.

Where a stabile osteosynthesis cannot be expected it is better not to nail; in these cases the old methods of osteosynthesis are better because there is less danger of infection.

A drain should be inserted in all cases of open marrow nailing and the limb immobilized in a plaster cast until all danger of infection has passed.

Where there is a relatively stabile osteosynthesis of the tibia there is danger of late abscesses forming if the limb is used too early, therefore, it is recommended that a walking cast be used until the fracture is united. If the patient complains of swelling or pain a walking cast should be applied immediately.

If infection develops the wound should be opened widely to prevent infection spreading to the marrow cavity.

The danger of infection is especially great in osteotomy of the femur united in angulation. This is particularly true if the fracture has been healed for a long time, as it will be very difficult to restore accurate anatomic conditions. It would be better to have a shortening and shorten the sound leg with the marrow nail.

Osteotomy and nailing should be performed as early as possible in femur fractures united in angulation.

Fractures in which a stabile osteosynthesis cannot be secured are not suitable for nailing.

In cases where there is considerable shortening or displacement the operation should be performed in two stages. The first stage to include osteotomy and wire extension, and then when the shortening is overcome, the open nailing should follow.

Where there is only a peripheral dislocation the nailing osteotomy should be performed remote from the fracture at the "site of choice."

Correctly performed nailing osteotomy of femur fractures united with angulation gives better results than with any other method.

Fractures of the femur less than 5 weeks old may be treated by closed nailing operation; thus all the advantages obtained in nailing of fresh fractures are retained.

It is important that fractures be thoroughly mobilized, even though they may appear movable. A reduction apparatus facilitates this operation.

If there is considerable muscle contraction it is necessary to first mobilize the fracture and correct the contracture by extension.

Femur fractures more than 5 weeks old should not be treated by closed nailing because of the danger of fat embolism.

It is not necessary to resect the bone in case of an ununited fracture of the femur.

Atrophy of the bone in old fractures of the femur excludes treatment by open nailing. Fractures less than 6 centimeters from the tip of the trochanter or from the knee joint are not suitable for nailing because a stabile osteosynthesis cannot be obtained.

The marrow nailing method is definitely superior to all other methods and danger of infection is slight if the osteosynthesis is stabile.

In osteotomy of tibia fractures united with angulation the marrow nail has no advantage over other methods. In case of infection the nail is an additional hazard, therefore, the old methods of osteosynthesis should be given preference.

Old tibia fracture with delayed callus formation may be treated up to 20 weeks after the injury by the closed marrow nailing if the fibula is resected and the fracture thoroughly mobilized. The advantages obtained will be the same as in fresh fractures.

In old previously compound or infected fractures where there is considerable muscle shortening, a wire extension should be applied for a period of 8 to 15 days following fibula resection and mobilization.

In open nailing of old tibia fractures there is serious danger of infection which may threaten the limb and sometimes the life of the patient if the osteosynthesis is not absolutely stabile. Utmost care is therefore necessary. If a positively stabile osteosynthesis is obtained and the proper technique applied good results may be expected; and nailing proves superior to all other methods; but if the fracture is more than 6 months old the marrow nail will be of no advantage either in case of an ununited fracture or a pseudarthrosis. A stabile osteosynthesis cannot be expected in such cases and a shortening cannot be avoided. If infection develops the nail will be an additional hazard.

The marrow nail is indicated in osteotomy of fractures of the humerus united in angulation, if a stabile osteosynthesis can be obtained. The fracture ends should be resected staircase shape far enough to open the marrow cavities. Additional wire suture is not necessary.

Fractures of the humerus up to 6 weeks old may be treated by closed nailing provided they are thoroughly mobilized before nailing. The results will be comparable to those obtained in fresh fractures.

Danger of infection is slight in nailing old fractures of the humerus if the fracture site is exposed.

Staircase-shape resection wide enough to expose sound bone is imperative in pseudarthrosis, but is not necessary in ununited fractures.

A faulty union of the humerus is often caused by distraction due to the weight of the arm if the osteosynthesis is not stabile.

Atrophy of the bone is no contra-indication to the nailing of old fractures of the humerus. The nails used must be long enough to be driven into the spongiosa of the epiphysis. An abduction cast in which the arm is elevated above the horizontal will be necessary until the muscles of the arm become strong.

The marrow nail is superior to all other methods for obtaining a stabile osteosynthesis in fractures of both bones of the forearm that have united in angulation. As a rule both bones have to be nailed; the nails will be driven in only if the bones are properly resected and brought into position.

Closed nailing should not be used in old fractures of the forearm.

There is danger of infection in nailing with exposure of the fracture site; the indication should be thoroughly checked and the operation restricted to cases in which a satisfactory reduction cannot be obtained by the conservative methods.

It is seldom possible to secure a wide abutment and fixation of the fracture ends in a pseudarthrosis of the bones in tranverse fractures. An attempt to obtain better conditions by resection and nailing the other bone seems more dangerous than a bone graft.

A Kirschner wire should never be used instead of a marrow nail.

To be continued in the first issue of the U. S. ARMED FORCES MEDICAL JOURNAL.



Experiences With Bone Graft Surgery in the Naval Service

JAMES W. TOUMFY, *Commander (MC) U. S. N. R.*

THIS series of reconstructive procedures in wartime surgery is presented at this time in order that the end results might be included. Seventy-four cases are reviewed, in which bone grafting operations were performed at the U. S. Naval Hospital, Great Lakes, Ill., during the 10-month period between 1 December 1944 and 1 October 1945. It is significant to note that in this series of cases, 75 percent of the bone graft operations were performed upon patients with compound fractures. Injuries were caused by perforating enemy missiles in 63 percent of the cases. An additional 12 percent had compound fractures due to other causes; the remaining 25 percent had simple fractures.

Bones involved were as follows: femur, 7; tibia, 11; bones of foot, 8; humerus, 17; radius and ulna, 24; bones of hand, 5; clavicle, 2; a total of 74.

The gunshot type of compound fracture is typified by extreme shattering and comminution of the bone fragments with attendant loss of bone substance (1) (2) (3) (4). These severe bone traumas, in themselves, tend to produce nonunion, no matter how expert the medical care may be from the moment of injury. Not only is the bone fragmented, but the associated soft part injuries are severe, resulting in fibrosis, scarring, contractures, and often the loss of adequate circulation upon which all bone depends for union.

Most of these compound fractures of the gunshot type were sustained at Iwo Jima or Peleliu. A typical patient received early first aid treatment, with sulfonamide powder in the wound, and splinting. Plasma was given if indicated. Large wounds, usually the wounds of exit, were treated by débridement the day of injury, or the day after, and a cast applied according to the principles of Orr (5) and Trueta (6). No attempt was made at primary closure.

Seven percent of our patients had had previous unsuccessful attempts at repair by the use of plates. We have no statistics to prove the success of plating in fresh fractures in naval service, but it is our

opinion that many failures resulted. The chief cause was inadequate surgery. In general, it may be said that the plates were too small, insufficient screw fixation was employed, and, frequently, the screws did not penetrate both cortices.

Very few patients had any form of mechanical pin fixation (7). Where Steinmann pins had been used to maintain length of the fractured shafts, two disadvantages were noted; nonunion caused by pin distraction (8), and a high incidence of osteomyelitis around these pins. The author recommends the use of Kirschner wires and bows fixed to the cast in place of the large Steinmann pins. The incidence of osteomyelitis around the Kirschner wires is low (9).

In none of these was penicillin given at the time of primary trauma. Several patients did receive penicillin a few weeks after their injury, but it was not until the patient reached Hawaii or the mainland that adequate penicillin therapy was instituted.

Closure by delayed suture was not practical in these patients because penicillin was not generally available at that time. In the future the author hopes and believes that healing of war compound fractures can be tremendously speeded up by the use of delayed sutures (10) combined with early skin grafting to cover large defects.

The wounds were greatly varied in the extent and amount of bone infection. Therefore, the time of healing varied greatly in most cases—from immediate, primary healing to 9 months from the time of original injury. The average time of complete wound healing was 15 weeks in this series of compound fractures.

The management of these patients after they reached the hospital was as follows: special attention was first given to the patient's general condition. The more seriously injured usually needed transfusions, although several months had elapsed from the time of injury. If the wounds were still unhealed because of sinus formation, sequestration, or osteomyelitis, a preliminary operation, sequestrectomy, for example, was carried out. If necessary, the patient was also studied by the departments of neurosurgery and plastic surgery. In certain cases, plastic and nerve procedures (11) were done prior to bone graft surgery.

In from 1 to 2 weeks after the wound had healed, the patient was considered ready for grafting. Since penicillin was readily available a long waiting period between the time of healing and the time of reconstructive surgery was not required. Penicillin was given routinely to all these patients for several days before the surgical procedure and was continued until the sutures were removed or, in most cases, until the wound was healed. The routine dosage was 25,000 units intramuscularly every 3 hours day and night, thus making 200,000 units every 24 hours. An immense amount of time was saved by

this routine. Before the advent of penicillin it was accepted orthopedic procedure to wait a year before grafting could be done with reasonable safety, and even then relighting of an old fracture was frequent.

THE USE OF GRAFTS (12) (13) (14)

In the repair of nonunion in the shafts of long bones (15) (16) (17) (18) (19), the grafts were usually taken from the tibia. In this series bone grafts were taken from this site in 71 cases, and from the ilium in only 3 instances.

The types of grafts employed were as follows: tibial onlay, 55; tibial inlay, 11; intramedullary, 5; and iliac, 3; a total of 74.

The operations were performed by 14 different surgeons, thus making for considerable variation in individual technic.

In the use of the tibial onlay graft it is important to use a graft wide enough and long enough to adequately resist the forces to which it will be subjected. The method of fixing these grafts which has proved simple, practical, and given altogether satisfactory results is by vitalium screw fixation (20). It is important that the bone surface to which the graft is screwed be flattened to receive the graft accurately. The tibial grafts were removed without periosteum as no advantage is gained by its retention (21).

The success of these operations depends on four main factors: (a) maximum approximations of viable bone ends; (b) the use of multiple small cancellous bone chips about the area of pseudarthrosis; (c) the use of an adequate graft; and (d) efficient plaster immobilization for a sufficiently long period.

FEMUR (22)

The solitary onlay bone graft is not strong enough to stand the terrific leverage forces to which it is subjected in the thigh; therefore, to prevent fracture and subsequent nonunion, it was our practice to use a plate in addition to the graft (fig. 1). The graft was placed on the lateral aspect of the femoral shaft and the plate was placed on the anterior surface of the bone, thus each supporting member gave great strength in its own respective plane, the graft affording anteroposterior strength while the plate provided lateral stability.

It is of great importance to use a tourniquet to prevent blood loss and undue shock in these major procedures upon the femur. The tourniquet may be used even when the nonunion is in the upper part of the shaft. A Steinmann pin is driven into the greater femoral trochanter in an oblique direction inward and distally so that the tourniquet can be wound above it. In this way it does not interfere with the operative incision.

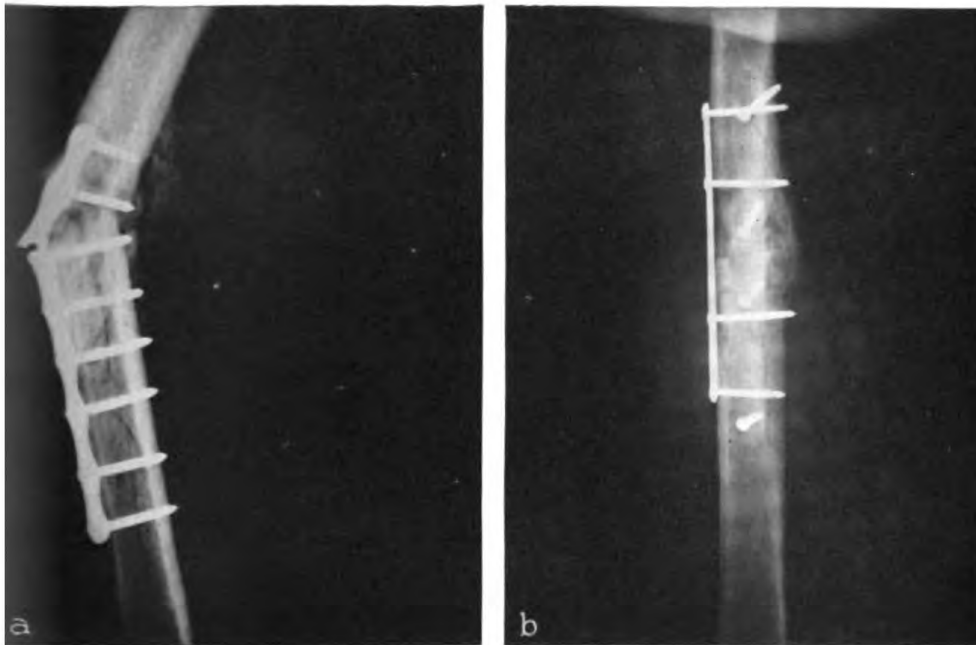


Figure 1.—(a) Compound fracture of femur, showing failure of inadequate plating and success of graft plus plate. (b) Six months after plating.

It was routine procedure, after femoral grafting, to immobilize the extremities in a double plaster spica cast for 12 weeks. The limb was not subjected to weight bearing until a caliper brace was fitted. When the cast was removed, extreme limitation of knee joint motion was the universal complication. To the author's knowledge, an entirely satisfactory solution to this problem has not been found. The Thompson quadricepsplasty (23), in our experience, resulted in a good range of motion but notable quadriceps weakness always persisted. It is the author's opinion that the post-operative adhesions between the quadriceps and the bone, as well as the long immobilization of the knee in the cast, produced the stiffness in the knee joint. This long period of immobilization may be considerably shortened by the use of a spica cast which is hinged at the knee.

It is believed that the posterolateral operative approach to the femoral shaft, as described by Bosworth (24) and Marcy (25), will do more than anything else to prevent knee stiffness. In this posterolateral approach, the quadriceps mechanism escapes operative trauma, and therefore adhesions between quadriceps and femur will be greatly lessened. The posterior approach was not used in any cases in this series; however, recent experience has proved it to be satisfactory.

Six cases of femoral grafting were followed an average of $8\frac{1}{2}$ months. In each instance a large onlay graft was used together with a plate placed at right angles to it, and these were secured with vitallium screws except in one instance in which, because of profound

shock, the wound was closed rapidly without any internal fixation of the graft. In this case satisfactory union took place. In one case a brace instead of a spica cast was employed post-operatively so that early knee motion could be instituted and 80 percent of knee flexion was secured in 7 months.

TIBIA

The writer believes that every surgeon in the department of orthopedic surgery at the U. S. Naval Hospital, Great Lakes, would agree that a bone plate should never be placed on the subcutaneous medial surface of the tibia under any conditions, even though this location has been universally used in war surgery, frequently with very poor

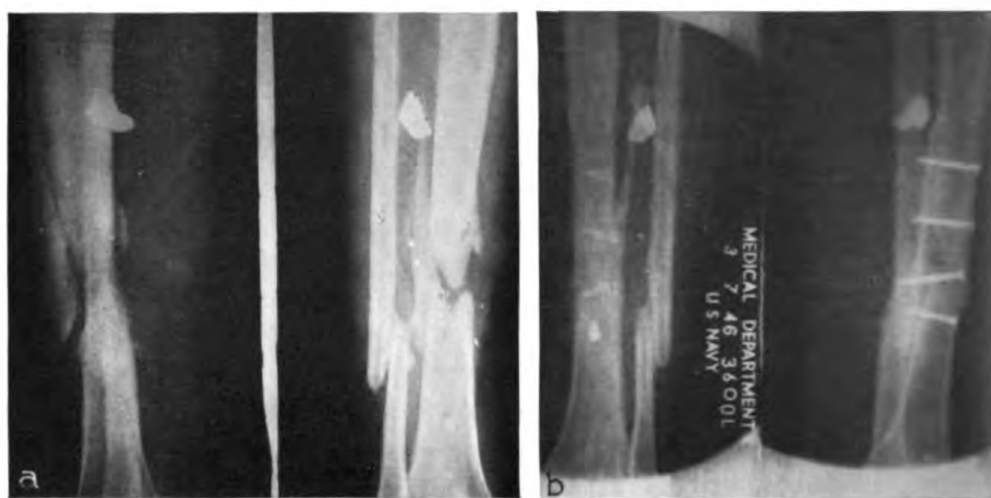


Figure 2.—(a) Compound fracture of tibia and fibula. Primary treatment consisted of débridement, sulfathiazole powder in the wound, and a plaster cast. Later a Stader unit was applied, but nonunion resulted. The original wound healed in 4 months. Eleven months after injury, an onlay bone graft was applied on the posterior surface of the tibia, through a medial incision away from the subcutaneous tibial surface. Primary healing resulted. (b) Six months after grafting showing firm union.

results. A plate so used causes the skin to break down and thus prevents healing in this location. Once skin necrosis occurs over the lower tibia with exposure of the bone and frequently the plate, the outlook for healing is always very grave. Infection, nonunion, and even amputation are the sequelae. In every instance the lateral or the posterior surface of the tibia should be used for plates and also for grafts even though it obviously makes the operation much more difficult (fig. 2).

Eleven cases of tibial graft were followed for an average of 7 months. In three the graft failed, resulting in nonunion and osteomyelitis. In two of the three the graft bridged an extensive defect. In one case (27) (28), a large central slough occurred in the

soft tissues but eventually healing took place. The author strongly recommends the use of the onlay graft for all cases of tibial nonunion. The graft should preferably be taken from the opposite tibia and should be placed on the posterior or lateral surface of the tibia. Plates or grafts should never be placed on the medial subcutaneous surface of the tibia because of inevitable injury to the overlying soft tissue.

HUMERUS

Relatively large bone defects in the humerus can be bridged with double onlay grafts by the use of multiple chips between these grafts. Very careful dissection is required in preparing a graft bed in the humerus to avoid injury to the radial nerve. After humeral grafting, a well-fitting spica cast is essential. In the author's opinion, it is important to change this cast at the time of suture removal, usually about the ninth post-operative day, to insure snug, well-fitting plaster immobilization in the crucial period while the graft is taking. It was our routine procedure to immobilize the limb in plaster for 3 months. It should be remembered that the maintenance of arm length is not as important as the maintenance of full leg length; therefore, a shortening of the humeral shaft to insure better union should be done as required (figs. 3, 4, and 5).

Fifteen patients with humeral grafting were followed for an average of 9 months. In 4 of these 15 cases, the graft failed, and in an additional case a second graft succeeded after the first graft failed. In this case, the first operative failure was caused by the use of a

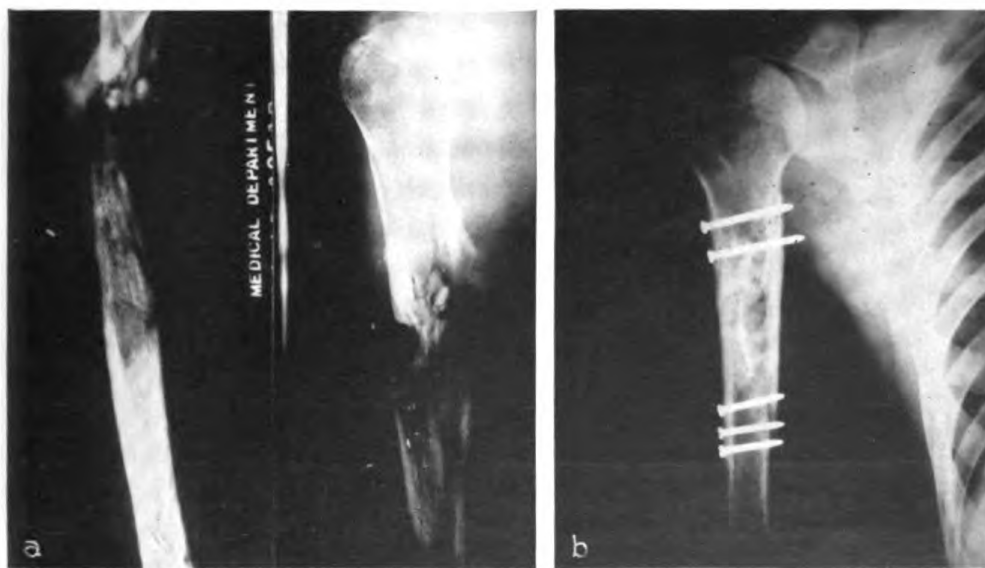


Figure 3.—(a) Compound fracture of the humerus. The nonunion was repaired by an onlay tibial bone graft 5 months after the original injury. (b) Roentgenogram taken 5 months after grafting demonstrates solid union.

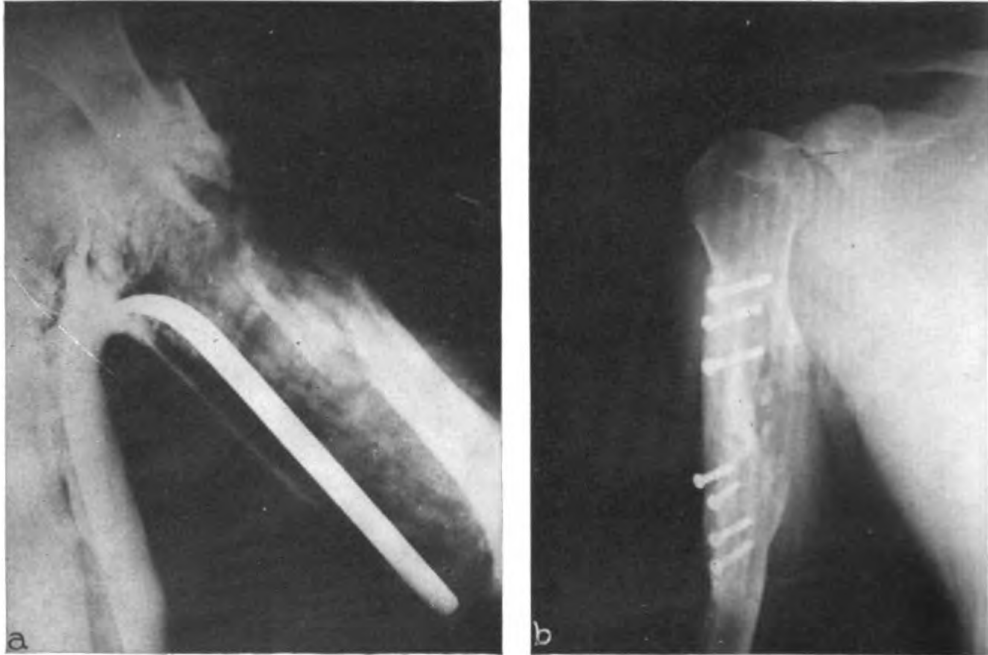


Figure 4.—(a) Compound fracture of humerus. The primary treatment consisted of débridement and application of cast. Four months after injury double tibial grafts were applied to bridge a 3-inch gap. (b) Shows solid union 9 months after grafting.



Figure 5.—Nonunion of humerus following compound fracture, which was treated by fixation with both a graft and a plate. These failed, and 9 months later a second tibial graft was applied which also failed. Eleven months later an iliac graft was applied which also failed. The patient was discharged because of nonunion.

hanging cast instead of a shoulder spica. Two cases were classed as failures in which arthrodesis was attempted between the glenoid and the humeral shaft. The graft fractured in both these instances. In these two cases with loss of the humeral head and upper humeral shaft, extensive multiple tibial grafts were used to bridge the defect between the scapula and the humeral shaft. An additional case was complicated by a simple fracture of the tibia at the donor site.

FOREARM

Special care must be used in forearm cases to place the grafts so that they will not interfere with pronation or with supination. The lower ulnar shaft and the lower extremity of the ulna are not necessary for good wrist function. Bone grafts have been used repeatedly to repair nonunions of the lower ulnar shaft in military surgery

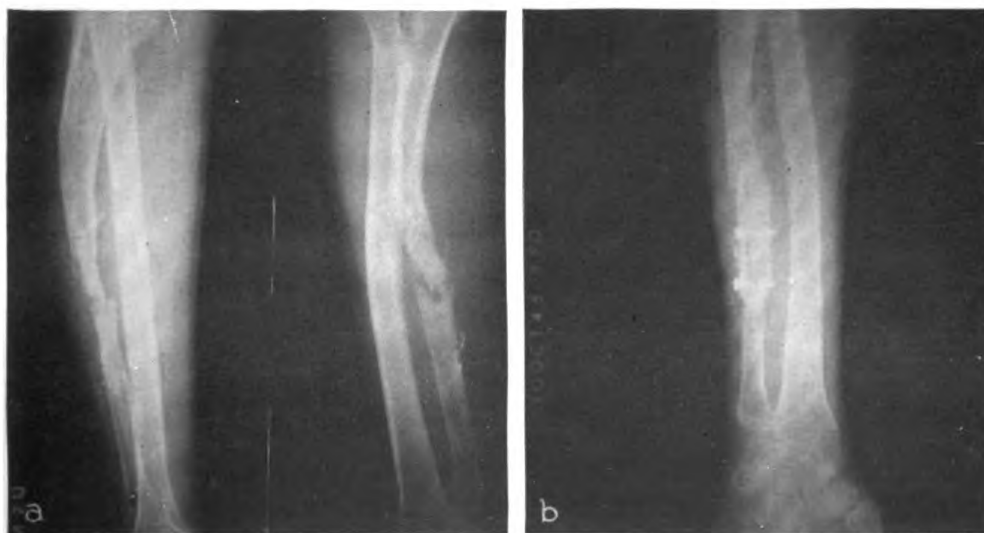


Figure 6.—Compound fracture of radius and ulna. The patient was treated primarily with sulfonamide powder and a cast. The wound healed in 5 months and a tibial graft was applied which was fixed to the ulna with catgut. This failed as shown in (a). The graft with two screws, shown in (b) succeeded.

when all that was necessary in these cases was the resection of the lower ulnar fragment. However, 25 cases in which one or both bones of the forearm were grafted were followed for an average of 6½ months. An unusual complication in one case was a fulminating gas gangrene developing directly after the grafting procedure, in spite of the fact that the patient had received penicillin before and after grafting, and that his original wound had been well healed before grafting was attempted. There were 3 other failures in this group, 2 because of nonunion and 1 because of osteomyelitis and nonunion (figs. 6 and 7).

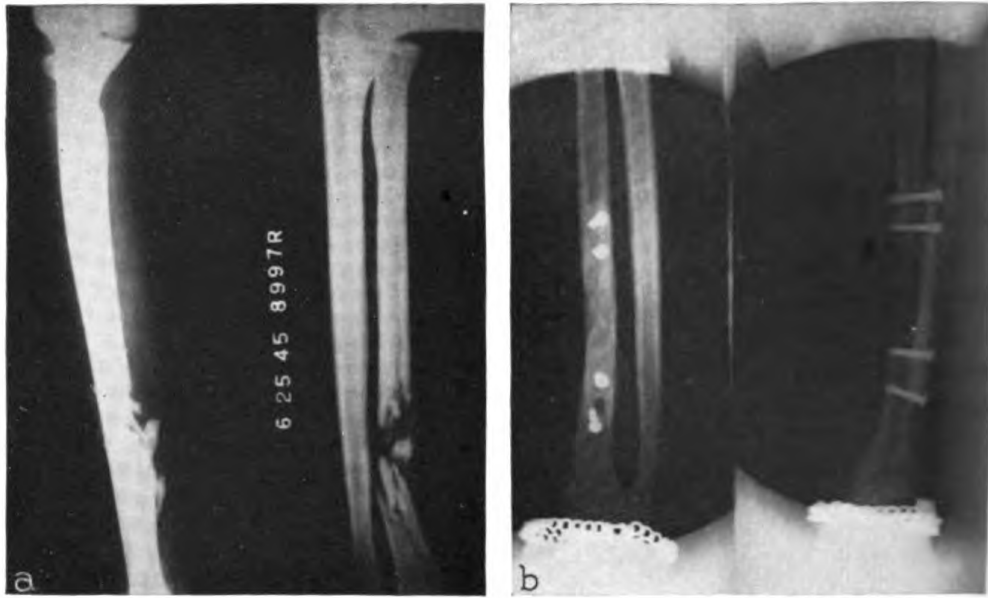


Figure 7.—(a) Compound fracture of the radius. This radial defect with loss of substance was repaired by a tibial graft. (b) Five months after grafting shows satisfactory union.

HAND AND FOOT

Eleven cases of grafting in the carpus, tarsus, metacarpus, or metatarsus were followed for an average of 5 months. Union resulted in every case.

CLAVICLE

Grafting procedures were attempted on two patients. Both resulted in failure. In one case a successful second grafting was done. Military experience had shown that in nonunion of this bone, resection of the lateral fragment of the clavicle is the treatment of choice.

SUMMARY

Seventy-four cases of bone grafting procedures in nonunion are presented. Injuries were caused by perforating enemy missiles in 63 percent of these cases. Primary treatment was débridement and local administration of sulfonamides. Penicillin was not widely available at this time and was not used primarily in any of these cases. Bone grafting in nonunion was performed from 1 to 2 weeks after complete healing of the wound had taken place.

In 75 percent of the cases the fractures were compound. The average age of the patients at the time of operation was 26 years. The most common sites of injury were the forearm, the humerus, and the tibia in that order.

In the cases of compound fractures, 15 weeks was the average healing time, the longest was 40 weeks and the shortest, 4 weeks.

There were six femoral grafts done; union resulted in all.

In the tibia, 3 of 11 cases failed, owing to soft tissue defects and the difficulty of bridging bone defects.

In the humerus, 4 grafts out of 15 failed; 2 of these were caused by attempted shoulder fusion with extensive humeral defects.

In the forearm, there were 4 failures out of 25 cases; 1 caused by a gas gangrene infection.

All 11 cases of bone grafting in the small bones of the hand and foot resulted in union. Grafting was unsuccessful in 2 cases of nonunion of the clavicle.

CONCLUSIONS

The most satisfactory graft was the tibial onlay type secured by vitallium screws augmented by cancellous bone chips at the site of pseudarthrosis.

In the femur it was necessary to use a plate as well as a tibial graft, and this plate must be placed in a plane 90° from the graft. A tourniquet should be used in femoral graft procedures to lessen shock. Early mobilization of the knee joint, after grafting procedures, helps to prevent extreme limitation of knee joint motion.

Tibial grafts or plates should never be placed on the subcutaneous surface of the tibia; the lateral surfaces are preferred for both plates and grafts.

A well-fitting plaster immobilization is essential after any bone graft procedure.

Attempts to bridge extensive defects of the upper humeral head and shaft with multiple bone grafts, to achieve scapulohumeral arthrodesis, fail because of excessive mechanical strain.

A resection of the outer fragment is preferable to grafting in nonunion of the clavicle.

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Bacteriostatic Coagulants as Fillers in Bone Surgery

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ADVANCES in technique have greatly enlarged the scope of orthopedic surgery, yet several problems remain as potential, if not actual, hazards: (a) Obliteration of cavities; (b) prevention of hematomas; and (c) prevention of infection. These are particularly important in the surgery of osteomyelitis, bone grafting, and arthrodeses which utilize iliac bone. Dick (1) has called attention to the relative frequency of hematoma formation at the iliac donor site; hematoma occurring in 3 cases in 11 from the anterior spine and 1 in 24 from the posterior spine. The formation of hematoma also occurs at the recipient site where it jeopardizes the outcome of the operation by floating away the grafts and disrupting good bony contact. In addition, hematomas form excellent sites for infection to progress in isolation from the systemic circulation. Thus a ready-made abscess is a potentiality.

To cope with these problems numerous suggestions have been offered. Muscle flaps and bone chips have their place of usefulness as reported by Robertson and Barron (2). It has been stated by Abbott et al. (3) that cancellous bone chips have a good chance of survival even in infected cases. This report recommends the judicious use of systemic penicillin and the local use of fibrin foam to prevent hematoma formation at the donor site of the ilium.

The "foam" products which have been widely used in recent years as coagulants may be divided into 3 groups: (a) fibrin foam is a product of fractionation of pooled human plasma. The fibrin fraction is processed and dried to form small spongelike segments which, when wet with thrombin, provide a soft mass with high coagulability. Since it is a human blood plasma product it does not have a foreign-body reaction and is not antigenic. (b) Gelatin foam is a product of similar use but manufactured from gelatin and is not a human biological product. (c) Oxidized cellulose foam is used similarly but it also is not a human plasma product.

During the early months of 1947 the author began to combine a bacteriostatic agent with a coagulant to provide a filler for cavities in

bone incident to grafting operations or excisions of osteomyelitic foci. Two hundred thousand units of penicillin were dissolved directly in an ampule of thrombin. This solution was used to wet the section of fibrin foam placed in a medicine glass. A section of the solid portion of this mixture was placed in the cavity at the donor site of the bone graft before closing the wound. The remaining portion of the fibrin foam and penicillin-thrombin menstruum was poured over the prepared bed of bone chips at the graft recipient site. Clotting occurred almost immediately, blood loss was diminished, hematoma formation was prevented, and an innocuous bacteriostatic agent was dispersed directly into the mesh of the clot which surrounded the cancellous bone chips.

The author has used this procedure in 5 cases. All healed primarily with no untoward reaction.

Case 1.—A large chronic Brodies abscess of the distal tibia was excised and packed with cancellous bone chips from the ilium.

Case 2.—An iliac onlay graft was applied to the ulna in a case of nonunion following a compound fracture.

Cases 3, 4, and 5.—These were routine spine fusions using iliac bone chips following removal of herniated intervertebral disks.

Although this procedure was evolved independently no claim to priority is made, for Baker and Smith (4) have reported the successful use of a similar procedure in a case of osteomyelitis of the skull; however, frontal lobe abscess followed which required a second operation. To the contrary, Buchman and Blair (5) have reported unfavorably upon the similar use of thrombin combined with oxidized gauze and thrombin with absorbable gelatin because of a large proportion of wound healing complications.

Carrell and Wise (6) have reported the following experimental evidence gained from in vitro tests: (a) the properties of thrombin and penicillin were rapidly destroyed by the presence of the oxidized cellulose product. This was attributed to the low pH of the oxidized cellulose. (b) Thrombin and penicillin showed no loss in potency in the presence of the gelatin foam product. (c) Thrombin and penicillin combined with each other without loss of potency of either. (d) Streptomycin was stable in all combinations and did not affect the other agents.

From the foregoing it appears that the rationale behind the combination of bacteriostatic agents with hemostatic agents is sound. Fibrin foam is the hemostatic agent of choice because it is derived from pooled human plasma and is free from foreign-body reactions. The successful use of penicillin combined with fibrin foam as a bacteriostatic filler has been cited in cases of osteomyelitis, nonunion fol-

lowing compound fracture, and in arthrodesis of the spine. This procedure appears to be indicated in the arthrodesis of joints following infectious arthritis. Experimental evidence suggests the combination of streptomycin with fibrin foam in a similar use in the arthrodesis of tuberculous joints.

SUMMARY

Clinical and experimental evidence of a useful combination of antibiotics and hemostatic agents for fillers in bone surgery has been presented. Suggestions for further usefulness of this procedure have been made from the data of experimental evidence.

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Acute Bacterial Endocarditis of "Escherichia Coli" Origin

Streptomycin Treatment

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THE prognosis of both acute and subacute bacterial endocarditis was "considered prognostically 97 percent fatal" (1) until the advent of the sulfonamides. These drugs reduced the mortality rate somewhat, but with the availability of penicillin in sufficient dosage the prognosis in subacute bacterial endocarditis became more hopeful.

Ninety-five percent of cases of subacute bacterial endocarditis are caused by *Streptococcus viridans* and the remainder usually by penicillin-susceptible organisms such as *Streptococcus hemolyticus* or *Staphylococcus* which engraft on a heart valve previously damaged by rheumatic disease or congenital defects. This diagnosis, while difficult at times, is not such a problem as that of acute bacterial endocarditis. In these patients the disease is caused by an invasion of the intact heart valves by gram-negative bacilli and other organisms which are usually penicillin-resistant. In some of these streptomycin has proved of specific value. It is hoped that this drug and the other new antibiotics may be of positive value in this disease.

Several reports in recent medical literature have proved the value of streptomycin in a considerable percentage of patients with bacterial endocarditis. The largest series was reported by Hunter (2) who treated 6 patients of his own and reported 12 additional cases furnished to him by Keefer. The infecting organisms included: *Enterococci*, 5 cases with 1 cure; *Streptococcus viridans*, 4 cases with 2 possible cures; *Pseudomona aeruginosa*, 2 cases with failure; *Hemophilus influenzae*, 1 case with cure; unidentified gram-negative bacillus, 4 cases with 3 cures; *Staphylococcus aureus*, 1 case with cure; and *Aerobacter aerogenes*, 1 case with failure.

Loewe and Eiber (3) reported 1 patient with subacute bacterial endocarditis of unknown cause who recovered after 46 days of streptomycin therapy. Previous treatment with penicillin and heparin in massive doses failed.

Meneely (4) reported 2 patients who developed bacterial endocarditis following urethral instrumentation. Both patients died although they were treated adequately with penicillin. The first patient's condition was caused by *Escherichia coli* and occurred in 1945 before streptomycin was readily available.

According to Fletcher (5) only 7 patients, including his own, who fully met the postulates of Harries and Burtenshaw (6) for the establishment of the diagnosis of *Escherichia coli* have been reported in the literature. According to these writers, positive blood cultures for *Bacillus coli* before death and from the heart vegetation after death together with gram stains on histologic sections of the vegetation showing gram-negative bacilli in significant numbers, should be the criteria used in establishing a case of endocarditis caused by *Bacillus coli*. Fletcher's patient died but, in his report, no mention is made of the therapy employed. White (7), however, states that 10.5 percent of all acute bacterial endocarditis is caused by *E. coli*.

McGarvey and Ernestene (8) reported 2 patients with subacute bacterial endocarditis caused by *S. viridans* in whom penicillin alone failed but recovery was obtained by additional treatment with streptomycin.

Zeller and Hirsh (9) treated 38 patients with bacterial endocarditis with penicillin. One of these had an immediate relapse when penicillin therapy was discontinued. Streptomycin was then employed successfully. The causative organism was *Streptococcus fecalis*.

Recently Cressey, Lahey, and Kunkel (10) reported two patients with acute bacterial endocarditis caused by alpha hemolytic streptococcus and *Pseudomonas aeruginosa*. The first patient recovered when treated with streptomycin after combined penicillin and sulfadiazine therapy failed. The second patient was apparently improving under streptomycin therapy when bacterial resistance developed and he died.

CASE REPORT

W. C. H., a 26-year-old white male, was admitted to the U. S. Naval Hospital, Philadelphia, Pa., for the second time on 13 April 1948 with a diagnosis of benign tertian malaria.

History.—His previous admission was on 7 August 1945 with a diagnosis of secondary anemia. This was thought to be caused by recurrent malaria originally acquired in the Southwest Pacific area in 1943. On admission he had chills and fever, and was pale and jaundiced. Otherwise, a complete physical examination was negative. A roentgenogram of the chest revealed no abnormalities of the heart or lungs.

Laboratory studies repeatedly failed to show *Plasmodia* in the blood smears. Red blood cell count, 3.0 million; hemoglobin, 5.0 gm.; white blood cells, 10,300; differential count included 13 percent eosinophils. A sternal marrow study showed 12 percent eosinophils. Subsequent stool examinations were positive for ova of *Necator americanus*. The diagnosis was established as hookworm disease.

Subsequently therapy included 8 blood transfusions and antihelminthic therapy (hexylresorcinol). On discharge (23 November 1945) the patient was asymptomatic, had a normal blood count, and repeated stool examinations were negative for *N. americanus*.

On the present admission the patient complained of chills and fever. He had been perfectly well from the time of his discharge from this hospital until 4 weeks prior to the present admission when he had had a chill followed by a rise in temperature to 102° F. He had 8 or 9 recurrent chills and fever with relative well being between attacks. The last attack occurred 4 days before admission. He was treated with quinine by his family physician because of the close resemblance of his complaints to those of malaria. Since then he had had 10 relapses all of which had responded satisfactorily to atabrine therapy.

His past medical history was negative except for childhood diseases without sequelae.

The family history was noncontributory. There was nothing revealing in his social or occupational history and a review of systems indicated no abnormalities.

Physical examination.—The patient was a well-developed, young white male who was alert, cooperative, and intelligent. He appeared acutely ill. Temperature, 102° F.; pulse, 100; respirations, 26; and blood pressure, 120/70. The only positive finding was a soft diastolic cardiac murmur, Grade 2. There was no thrill or cardiac enlargement, but the murmur appeared louder (Grade 3), in the supine position. Examination of the abdomen was negative and no petechiae were noted.

Admission laboratory studies.—Six smears negative for *Plasmodia*; blood Kahn test, negative; red blood cell count, 4.55 million; hemoglobin, 11.5 gm.; white blood cell count, 13,200; differential, 4 percent bands, 87 percent segmented, 7 percent lymphocytes, and 2 percent monocytes; urinalysis, negative; and blood urea nitrogen, 16 mg. per 100 cc. blood.

Course.—The patient had daily chills, and his temperature rose to peaks of 102° to 105° F. The pulse was correspondingly elevated from rates of 100 to 120 a minute, while respirations remained between 18 and 24.

When repeated smears failed to reveal *Plasmodia*, daily blood cultures were taken. Eleven of these were negative and one was positive for *Escherichia coli* but this was regarded as a probable contaminant.

Atabrine was prescribed on 24 April and for 5 days thereafter because of the past history of malaria with frequent and recent relapses. However, the daily chills with temperature rises to 104° and 105° F. persisted. After the fever reached its peak, the patient perspired profusely and the temperature returned to normal or below.

On 27 April the temperature spiked to 103° F. with a remission to 97.4° F. and a secondary rise to 99° F. The pulse rose and fell correspondingly. Red blood cell count, 3.5 million; hemoglobin, 9 gm.; white blood cell count, 8,200; with 5 percent bands, 85 percent segmented cells, 1 percent basophiles, 3 percent lymphocytes, and 6 percent monocytes; urinalysis, negative except for 1 plus sugar resulting from the intravenous fluids used as support therapy; electrocardiogram revealed only left axis deviation; and photofluoroscopy of the heart and lungs showed no abnormality.

Repeated physical examinations showed only the murmur in the mitral area which appeared to be somewhat more harsh. There was uncertainty as to whether it was systolic or diastolic because of tachycardia; and because of the anemia it could not be determined whether it was of functional or organic significance. No other confirmatory physical signs of bacterial endocarditis were elicited. Daily smears for *Plasmodia* were negative and the stools were negative for ova and parasites—the search was conducted particularly for *Endamoeba histolytica*. Blood urea nitrogen was 11.2 mg. per 100 cc. blood.

On 3 May chloroquine was employed but had no effect on the chills and fever which spiked at least once and sometimes twice daily. On 4 May the temperature rose to 105° F., so treatment with chloroquine was discontinued. The red blood cell count, on 5 May, was 2.4 million; hemoglobin, 8.0 gm.; white blood cell count, 13,820 with 10 percent band forms, 89 percent segmented cells, 6 percent lymphocytes, and 3 percent monocytes. Blood transfusions were started and given every day or every other day. A mild icteric tint developed, the urine became darker with 2 plus albumin. Serum bilirubin rose to 1.4 mg. per 100 cc. blood. The spleen was palpable at this time.

At this time the diagnosis of subacute bacterial endocarditis was considered. Penicillin was withheld while arrangements were made with the laboratory for a special blood culture technique using 25 to 30 cc. of blood. The ophthalmologist reported small oval areas about the macula with pigmented borders suggesting the appearance of an old inflammatory process, possibly embolic in origin. A gastro-intestinal series and barium enema revealed no abnormalities of the alimentary tract but confirmed the enlargement of the spleen and a moderate enlargement of the liver. Fluoroscopic examination showed no evidence of heart, lung, or great vessel abnormality.

The patient's course had been steadily down hill until maintenance was obtained by repeated blood transfusions.

On 12 May roentgenogram of the chest showed no evidence of disease of the heart or lungs, and no evidence of subdiaphragmatic collection of fluid. The red blood cell count was maintained around 2.5 million by blood transfusions. Blood culture were still sterile. Crystalline Penicillin G was then administered; 200,000 units every 2 hours, day and night. The chills, fever, and general condition remained unchanged, and the dosage was changed to 500,000 units every 3 hours. Cystoscopic study revealed no genito-urinary abnormality.

On 16 May, the forty-third day of hospitalization, sulfadiazine, 6 gm. daily in divided doses was added, but the septic course continued until 20 May when the temperature rose to 105.4° F. At this time the laboratory reported 4 blood cultures positive for *Escherichia coli*.

Penicillin and sulfadiazine were discontinued and streptomycin, 0.75 gm. every 6 hours was given by intramuscular injection. The result was immediate—from 21 May the temperature remained normal with an occasional rise (without preceding chills) to 99.6° or 100° F. After 23 May he was afebrile, the jaundice began to clear, the splenic enlargement receded, and the red blood cell count progressively increased without transfusions concomitantly, the intensity of the diastolic mitral murmur (which had been Grade 2) increased to Grade 6.

Streptomycin, 3.0 gm. daily in divided doses was continued for 4 weeks; a total of 84 gm. Fortunately, no sequelae of this therapy were noted. He gained weight until his former weight was reached. After 2 weeks further convalescence he was discharged on 2 July.

The patient was reexamined on 24 January, over 6 months after discharge. He reported that his health had been excellent, he worked continuously, and had even gotten married. His weight increased to 180 pounds. Complete phy-

sical examination was negative; no cardiac murmur was audible; urinalysis was negative; the red blood cell count was 5.47 million; hemoglobin, 16 gm.; white blood cell count, 6,550 with normal differential; and the sedimentation rate was 1 mm. maximum fall, in any 5-minute period. Roentgenograms showed no abnormalities of the heart or lungs, and the heart measurements were well within normal limits. The electrocardiogram revealed left axis deviation; from this it is inferred that the mitral lesion was cured and complete resolution of the valve injury had occurred.

DISCUSSION

The problem of differential diagnosis was an intriguing one. The major conditions considered were: malaria; amebic abscess; pyelonephritis; perinephric abscess; acute and subacute bacterial endocarditis; tuberculosis; and brucellosis.

The septic temperature, the soft mitral murmur, present on admission, and repeated sterile blood cultures (with the exception of one positive for *E. coli* which was considered to be contaminated) were the only positive findings in the first few weeks of the disease. Anemia, jaundice, splenomegaly, and embolic lesions of the macula appeared later, but still no confirmatory blood cultures were reported. Since *S. viridans* is the most common cause of subacute bacterial endocarditis, penicillin was finally prescribed in order to insure specific therapy for hidden infection with this organism.

However, when penicillin alone or with sulfadiazine brought about no change, consideration was given to the use of streptomycin or emetine, the latter because of the possibility of amebic abscess of the liver. Fortunately, at that time 4 cultures taken with massive blood technique were reported positive for *E. coli*. Streptomycin produced a prompt and dramatic response. Reexamination 6 months after discharge indicated recovery had been complete with no residual valvular sequelae.

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Aureomycin in the Treatment of Infectious Mononucleosis

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THIS is a preliminary report on the use of aureomycin in the treatment of infectious mononucleosis. Infectious mononucleosis is a disease in which symptomatic therapy has been the only therapy used to date. The disease is well known and has been well described by many authors. Bernstein (1) prepared a classical monograph on the subject.

Last year over 70 cases of infectious mononucleosis were admitted to our medical service. All cases were treated symptomatically; aspirin and other coal-tar derivatives were prescribed and occasionally penicillin was administered for associated pharyngitis or Vincent's angina. Our previous experiences and those of others (2) (3) (4) showed that this antibiotic had no effect on the course of the disease but did seem to combat complicating bacterial infection.

The average duration of adenopathy, general malaise, fever, and other symptoms was 2 weeks. Atypical mononuclear cells of Downey usually persisted for about 3 weeks and in a large number of cases persisted well into the convalescent stage. Their presence was not related to the residual asthenia noted in some of these patients. Adenopathy at times persisted. The heterophile agglutination was irregular in its appearance, occurring early with increasing titers or sometimes appearing in the later stage of the disease, or, more infrequently, in the convalescent stage. This irregular appearance of diagnostic heterophile titer has been noted previously by various authors and, more recently, stressed by the Yale Group (5). In their group of cases there were 10 in which hepatitis was a complication, and it was observed that the splenomegaly usually disappeared before the adenopathy unless liver involvement occurred.

With the availability of Aureomycin (6) (7) (8) for treatment and its dramatic curative effect in primary atypical pneumonia (9) (10) (11) as well as its value in infectious hepatitis (12) (13) we were prompted to use this drug in the treatment of infectious mononucleosis. The results have been exceedingly gratifying. Further study of the

use of Aureomycin in infectious mononucleosis is being carried out in a larger series of cases to be presented at a later date. Control was established by treating alternate cases without Aureomycin. The following are abstracts of three cases treated with Aureomycin.

CASE REPORTS

Case 1.—K. E. C., a 26-year-old white male, was admitted on 12 February 1949 with a history of general malaise, fever, pain in legs, back, and joints for 4 days. Vomiting had occurred once. There was no abdominal pain, diarrhea, or cough, but he had a slight sore throat. Physical examination: temperature, 102° F.; pulse, 96; respirations, 20; blood pressure, 140/70; ears, slight reddening of both canals; there was no nuchal rigidity. A few transient dry râles which disappeared on coughing were present in the right posterior field of the lungs. The remainder of the physical and neurological examination was normal. Laboratory report: red blood cells, 4.5 million; white blood cells, 3,000 per cu. mm. (on admission).

On the first hospital day his temperature was 102° F., and the patient was quite lethargic. The white blood cell count on this day was 2,900 per cu. mm. with 4 percent band forms, 40 percent polymorphonuclears, 52 percent lymphocytes (40 percent of which were atypical), 2 percent monocytes, and 2 unidentified cells. General supportive measures were prescribed and 200,000 units of penicillin were administered 3 times a day.

On 14 February 1949 a blood smear showed 50 to 60 percent mononuclear and lymphocytic cells characteristic of infectious mononucleosis. Two grams of Aureomycin a day were then administered. The spleen was not palpable nor were there any enlarged lymph nodes. On 15 February the sternal marrow aspiration smear was normal; the temperature was 100° F. On 17 February the leukopenia persisted; the BSP showed 40 percent retention in 45 minutes; the thymol turbidity was 1.98 units; urinalysis was negative; chest roentgenogram was normal; and urine urobilinogen was negative. On 20 February the Aureomycin was discontinued. The temperature was normal from the second day of therapy and the patient felt well. On 21 February, the heterophile agglutination was negative; cephalin flocculation was 2 plus in 24 hours and 3 plus in 48 hours; white blood cell count was 8,500 per cu. mm. with a differential count of 44 percent segmented granulocytes, 52 percent lymphocytes, 2 percent eosinophils, and 2 percent monocytes; the sedimentation rate was 2.0 mm./hr.; and the thymol turbidity was 3.33 units. On 23 February the zinc turbidity was 6.8 units. On 3 March the heterophile agglutination was again reported negative.

The patient felt well and was up and about the ward the first day his temperature was normal. His temperature remained normal from the seventh hospital day and the first day of Aureomycin therapy. The liver and spleen were never palpable. There was no lymphadenopathy, and the pharynx was normal. He was discharged to duty 9 March 1949.

Case 2.—E. A. S., a 23-year-old male, was admitted on 26 February 1949 with a history of general malaise, stiff neck, headache, and constipation of 6 days' duration. Two days before admission he noted malaise, fever, and chills. The past history was noncontributory.

Physical examination: Temperature, 101° F.; pulse, 90; respirations, 18; and blood pressure, 120/70. The pharynx was red; there was no nuchal rigidity; the posterior cervical lymph nodes were enlarged but not tender. Laboratory report: Red blood cell count, 4.47 million; white blood cell count, 10,600 per cu. mm., with a differential of 30 percent segmented neutrophils, 66 percent lymphocytes

with many immature and Downey type mononuclear cells; the heterophile agglutination was positive in a dilution of 1:224.

On the second hospital day when the temperature was 102° F., 2 gm. Aureomycin a day were administered. Within 24 hours the temperature was normal, the pharynx had cleared, the cervical adenopathy was no longer present, and the patient felt well. He was ambulatory on the fourth hospital day, and was discharged to duty on the seventh day.

Further laboratory work revealed that the heterophile was still positive in 1:224 dilution on the sixth hospital day. His white blood count was 9,000 per cu. mm. with a differential of 22 percent segmented neutrophils, 78 percent lymphocytes including atypical vacuolated mononuclear cells; the blood Kahn reaction was negative; the serum zinc turbidity was 12.4 units; the serum phenol turbidity was 13.7 units; and the urinalysis was negative.

Case 3.—W. H. M., a young adult male, was admitted on 5 March 1949, complaining of chills, fever, and malaise. Twenty-four hours before admission he had a moderately severe chill during the night. He then noted myalgia, fever, and a sore throat. Anorexia, myalgia, and malaise became progressively worse.

Physical examination: Temperature, 102° F.; pulse, 100; respirations, 20; and blood pressure, 120/80. The pharynx was red and covered with an exudate. Cervical lymph nodes were palpable; the neck movements were guarded; the liver edge was palpable and tender; the spleen was thought to be palpable; and the axillary and epitrochlear lymph nodes were enlarged and palpable.

Red blood cell count, 3.9 million; hemoglobin, 13.0 gm.; white blood cell count, 11,650 per cu. mm., differential count, 32 percent segmented neutrophils, 45 percent nonsegmented neutrophils, 22 percent lymphocytes, and 1 percent atypical mononuclear cells; the sedimentation rate was 15 mm./hr.; and urinalyses and blood Kahn reactions were negative.

On 7 March 1949, the fourth hospital day, the white blood cell count was 6,500 per cu. mm. with a differential of 43 percent segmented neutrophils, 54 percent atypical mononuclear cells (Downey type), and 3 percent eosinophils; the heterophile agglutination was positive in 1:56 titer; zinc and phenol turbidity of the serum were normal; and the total proteins, serum albumin, and serum globulin were normal.

On 9 March, the second hospital day and the sixth day of the disease, 2 gm. Aureomycin were administered. The next morning his temperature was normal and he was symptomless. The drug was discontinued after 24 hours and at this time the liver was not palpable. The posterior cervical lymph nodes gradually receded and disappeared on the ninth hospital day. On 21 March, the sixteenth hospital day, the white cell count was 7,300 with a differential of 32 percent lymphocytes, 3 percent monocytes, and 63 percent segmented neutrophils, and 2 percent nonsegmented neutrophils.

He was discharged to duty on the twentieth hospital day, but was ambulatory after the fifth hospital day.

DISCUSSION

Aureomycin was administered in a dosage of 250 milligrams 4 times a day for 6 days. This dosage was decided upon because of the expense and the limited supply of the drug. The cases chosen all had a classical clinical picture; the presence of atypical mononuclear cells (Downey type) in the blood smear. In some the heterophile agglutination was positive. Whether the agglutination will always

be positive in patients treated with Aureomycin is to be determined. However, in some cases a previously negative titer became positive after treatment was stopped. In some cases a diagnostic titer appeared late in the disease, however, if Aureomycin therapy had been continued for a longer period, the positive titer may not have appeared. Rose (14) has shown that in patients with rickettsial pox under treatment with Aureomycin the complement fixation test can be prevented from developing even though positive blood cultures are obtained.

In our cases with a dosage of 2 gm. a day, the symptoms subsided and the temperature returned to normal within 48 to 72 hours after beginning treatment; in several patients this occurred within 24 hours. The first 3 patients showed a normal blood smear within 3 days, but in others the abnormal cells were present well into the convalescent stage.

The fact that this disease responds to Aureomycin may give some support to the idea that infectious mononucleosis is caused by a virus. The virucidal properties of Aureomycin have been well described by Wright et al (15).

Since Aureomycin appears to be effective in the control of infectious mononucleosis it is conceivable that it may also prevent many of its complications such as hepatitis, acute involvement of the central nervous system, myocarditis, and rupture of the spleen. There are, at present, three cases of hepatic complications of the disease under study in which Aureomycin is being used. In one all abnormal hepatic function tests and evidence of enlarged liver and spleen disappeared within 10 days.

SUMMARY

In three cases of infectious mononucleosis treated with Aureomycin all symptoms disappeared and the temperature became normal within the first 24 hours after treatment was started.

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Infectious Mononucleosis

Report of a Relapsing Case Treated With Chloromycetin

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INFECTIONOUS mononucleosis is widely recognized as a disease of protean manifestations, and one which has a tendency for frequent relapses. While its usual duration is about 1 month, it is not unusual to encounter cases where the course is prolonged. It has recently been suggested that a chronic form of the disease exists which is frequently misdiagnosed or overlooked (1).

The prolonged, frequently relapsing case has always been a difficult one to manage, since there has been no specific therapy for the condition, and palliative measures are usually met with only indifferent success. With the advent of the antibiotics, it was hoped that one would emerge which would prove effective against the virus which is presumed to be the etiologic agent of this disease. Chloromycetin was believed to hold some promise in this connection. The purpose of this article is to report the results of Chloromycetin therapy in a case of protracted, relapsing infectious mononucleosis.

CASE REPORT

A 42-year-old naval officer, who had been in good health until late July 1948, developed general malaise associated with pain in the cervical region. The malaise became more severe during the first week of the illness, and at its conclusion, cervical and inguinal lymphadenitis was demonstrable. During the second week dysphagia developed, and physical signs of a posterior pharyngitis were present. Fever did not exceed 100° F.

Physical examination revealed a well-developed, slightly obese, pyknic type of individual. The skin was clear. The posterior pharynx was reddened and slightly edematous mucosa and generalized nontender lymphadenopathy was noted. The spleen was not palpable but on percussion the area of splenic dullness appeared to be increased. On pressure in the left flank, some tenderness was elicited. From time to time during the course of the disease, a twisting motion of the trunk to the left produced pain in the left flank. Otherwise, the physical examination was negative.

Roentgenogram of the chest showed only a healed childhood type of complex in the hilar region.

Examination of the peripheral blood showed: hemoglobin, 14.0 gm.; white blood cells, 9,000; differential: polymorphonuclears, 45; immature polymorpho-

nuclears, 6; lymphocytes, 32; monocytes (mostly atypical), 16 (fig. 1); eosinophils, 2; and basophils, 0. The large percentage of typical "mononucleosis cells," the relative lymphocytosis, the lymphadenopathy, and the symptoms were sufficient to warrant a diagnosis of infectious mononucleosis.

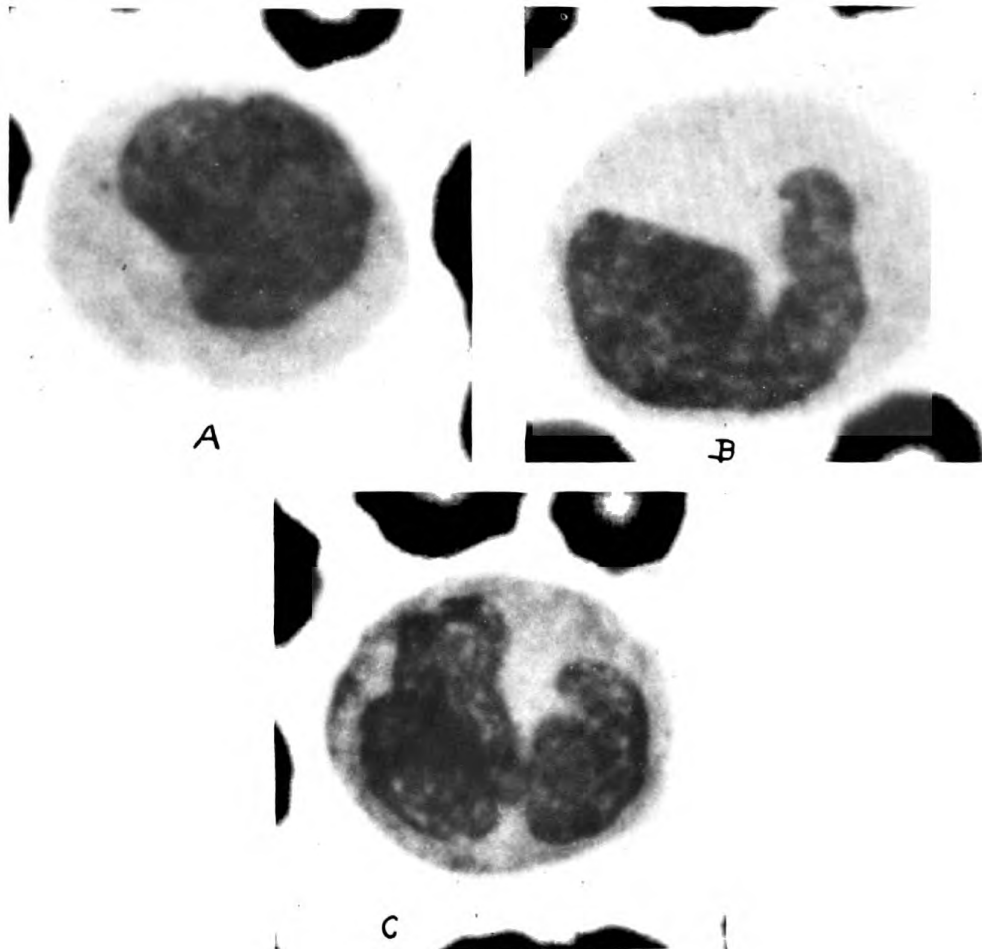


Figure 1.

At that time a heterophile antibody titer (Davidsohn) was 1:28. The test was repeated many times since then, but no higher titers have been found. Usually they were around 1:8.

At weekly intervals between August 1948 and March 1949 peripheral blood films were examined. Between 10 and 16 percent of large mononuclear cells typical of the disease were present. On no occasion during this period was any difficulty encountered in demonstrating these cells in the smears.

During this same period the patient felt distinctly below normal. Malaise would frequently recur for several days followed by periods of improvement. He complained of easy fatigability and recurrent pain in the cervical, inguinal, and flank regions; fever was not prominent. The adenopathy persisted and seemed exaggerated when the subjective symptoms became worse. The spleen was never palpable.

Treatment was symptomatic; usually coal tar analgesics or aspirin were prescribed. Adrenal cortical extract, as recommended by Isaacs (1) was ad-

ministered for several weeks with improvement in the subjective symptoms, but without apparent effect on the lymphadenopathy, or on the peripheral blood picture.

In March, a supply of Chloromycetin was made available to us and the drug was administered in the form of 250 mg. capsules according to the following schedule: for the initial dose, 50 mg./kg of body weight was given in 3 divided doses. Thereafter 0.5 gm. was given at 4-hour intervals for the next 8 days. A total of 25 gm. was administered.

Prior to treatment with Chloromycetin physical examination was made and found essentially negative, except for the presence of a generalized, shotty lymphadenopathy. The spleen was not palpable.

The hemogram showed essentially the same picture that had been present for the previous 7 months: hemoglobin, 12.5 gm.; white blood cell count, 9,400; polymorphonuclears, 56; immature polymorphonuclears, 5; lymphocytes, 22; monocytes, 12; eosinophils, 3; and basophils, 2.

There were many easily recognized large mononuclear cells of the lymphocytic series. The nuclei demonstrated fenestration, were deeply lobulated, and, in some instances, bizarre. The cytoplasm stained deeply and presented a "foamy" appearance. Frequent cytoplasmic vacuoles were found.

A recheck on the heterophile antibody titer (Davidsohn) was 1:8. Agglutination studies for brucella and tularensis antibody titers were negative.

Liver function was normal as indicated by an icterus index of 4; a negative cephalin flocculation test; and a thymol turbidity of 2.9 units.

During the first 48 hours of Chloromycetin therapy there was an apparent exacerbation of all signs and symptoms. The lymphadenopathy seemed exaggerated, and the subjective symptoms became more profound. The effect on the peripheral blood is shown in figure 2; the number of atypical lymphocytes increased significantly.

After this exacerbation the symptoms abated and the adenopathy gradually subsided until, at the end of 2 weeks, no nodes were palpable except for one in

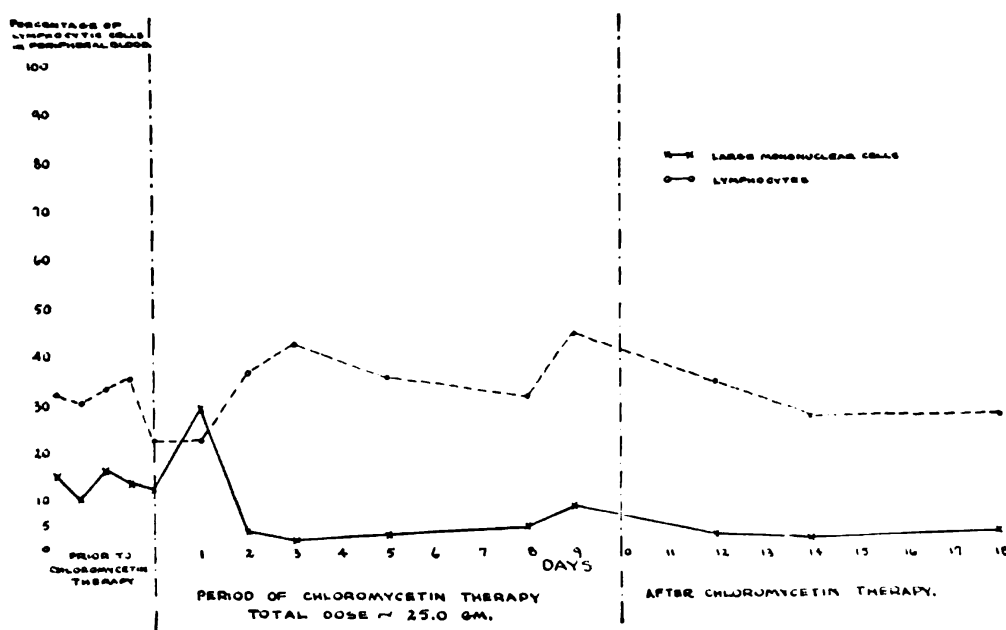


Figure 2.

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the left supraclavicular region. The hemogram became normal. It was apparent to both the patient and to the author that something had occurred coincident with the administration of Chloromycetin which radically altered what had been a relatively static clinical picture for 7 months.

The most striking feature in the hemogram was the disappearance of the typical "mononucleosis cells" from the peripheral blood, and that the remaining monocytes appeared normal. If the presence of these cells in the peripheral blood can be regarded as evidence of the continuing activity of the disease; then, coincident with the administration of Chloromycetin, the disease became inactive.

Side effects.—During the period of administration, the patient stated that his sense of taste was altered; food lost its savor, and smoking was not pleasant. The other side effect was the dramatic appearance of a sensitivity response. Shortly after the evening meal on the sixth day of treatment, and about 2 hours following the ingestion of 0.5 gm. of the drug, the patient suddenly felt somewhat dizzy; his face became flushed; numerous red macular lesions about 0.5 cm. in diameter appeared over the face; and the pulse and respiratory rates became accelerated. There was no associated pruritis. These signs and symptoms persisted for about 30 minutes, and then subsided spontaneously. The same syndrome recurred shortly after the last dose of the course of treatment.

Course.—Since the completion of Chloromycetin therapy the patient has had no recurrence of signs or symptoms other than the complaint of occasional fleeting pains in various parts of the body. These can be largely accounted for on a psychosomatic basis. There is no residual adenopathy except for the persistent node previously mentioned, and the peripheral blood picture appears entirely normal.

SUMMARY

Chloromycetin apparently offers much in the treatment of this debilitating condition. The drug seems to be quite safe, so that little harm is likely to result from its use.

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Tularemia

Report of a Case Treated Successively With Streptomycin and Aureomycin

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STREPTOMYCIN has been considered a specific in the treatment of tularemia since 1944. In that year the drug was reported by Heilman (1) to have been used successfully against tularemia; and by Foshay and Pasternak (2) to have shown great promise in the treatment of seven clinical cases of the disease. These results have been repeatedly confirmed since that time, and a large number of cases have now been reported in which streptomycin was used as a primary therapeutic agent.

Recently a report (3) appeared which compares the use of Aureomycin and streptomycin in experimental tularemia, and describes the successful use of aureomycin in three human cases of the disease. The results of this study show that Aureomycin is at least as effective as streptomycin in this particular infection. However, to date there has been no comparative study available of the two drugs in human cases. Recently the authors observed the results of the use of streptomycin and Aureomycin successively in one case of human tularemia of the ulcero-glandular type.

CASE REPORT

The patient, a 62-year-old white female, an inhabitant of a suburb of Chicago, Ill., was admitted to the hospital on 25 April 1949. She had become ill with severe chills, fever, and general malaise on 9 April 1949 and 2 days later 2 pustules appeared on the index finger on the right hand. Since then chills and fever had been present daily, and she had noted the progressive enlargement of the lymph nodes in the right epitrochlear area and the right axilla. She was treated during this time with penicillin and sulfadiazine with no noticeable improvement.

Further questioning revealed that during the weeks preceding her illness both the patient and her son had repeatedly handled wild rabbits brought home by their pet dog. Her son had become ill with an identical illness, including infection of the fingers, at the same time as the patient.

Physical examination.—The patient was an elderly white female who appeared acutely ill. There were 2 ulcerative lesions about 1 cm. in diameter on the right index finger and there was moderate tenderness and enlargement of both

the epitrochlear and right axillary lymph nodes. The heart and lungs were normal to examination, and the liver and spleen were not palpable. Roentgenogram of the chest was normal.

Agglutination tests of the patient's serum for *Pasteurella tularensis* were negative at the time of admission, but because of the typical clinical picture of the disease, treatment was started at once with streptomycin in daily doses of 1.5 gm. However, the patient continued to have extreme general malaise and a daily temperature elevation to approximately 100° F. During the following 10 days there was no subjective or objective improvement in the patient's condition, although she received continuous streptomycin therapy. The dose of the drug was increased twice until she was receiving 3 gm. daily during the final days of this period. On the evening of 4 May Aureomycin therapy was started in dosage of 500 mg. every 4 hours; streptomycin was discontinued. The following day the patient voluntarily stated that she felt much stronger and that her general malaise and weakness had noticeably decreased. On the morning of 6 May the temperature became normal and remained normal during the following 7 days of Aureomycin therapy. There was improvement in the tenderness and swelling of the lymph nodes although moderate swelling did remain at the time of the patient's discharge from the hospital.

The diagnosis of tularemia was confirmed by a persistent rise in the agglutination tests of the patient's serum for *P. tularensis*. One week after admission this agglutination was read at a strength of 1:640. The patient was discharged on 16 May in excellent general condition. The only residual sign of her disease at that time was a moderate enlargement of the lymph nodes in the right epitrochlear and right axillary area.

COMMENT

This case is unusual in view of the poor response to streptomycin in spite of adequate dosage. In most of the previous case reports streptomycin in a dose of 1 gm. daily usually caused the temperature to return to normal limits within 48 hours. Cases with a longer duration of fever were those in which the disease had been present for 2 weeks or longer before treatment was started. However, even in these cases improvement usually occurred within 4 or 5 days. In the case reported here, even after 10 days of therapy with streptomycin, the patient's condition showed slight clinical improvement and her temperature had not decreased from that at the time of admission. Following the use of Aureomycin the patient noted a prompt improvement in her general condition and commented upon it without questioning. This was substantiated objectively by the return of temperature to normal limits and decrease in tenderness and size in the involved lymph nodes. It is possible that this prompt response to Aureomycin was aided by the fact that virulence of the infective organism was attenuated by the preceding streptomycin.

SUMMARY

One case of tularemia treated successively with streptomycin and Aureomycin is reported. During 10 days of therapy with strepto-

mycin in adequate dosage the patient showed only slight subjective improvement and no decrease in temperature. Following Aureomycin therapy the patients temperature returned to normal and the patient's clinical condition improved.

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Rheumatic Fever

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RHEUMATIC fever, despite new techniques in chemotherapy, continues to be one of the problems of importance in naval medicine. For this reason this series of 158 patients treated in a naval hospital is reported. The majority of the patients were admitted to the sick list elsewhere and then transferred to this hospital. Of the 158 patients, 150 were white and 8 were colored. Their ages ranged from 17 to 39; but 135 (85.4 percent) were under 20 years of age. One hundred and four (65.9 percent) had been in the Navy less than 6 months at the time of admission and 32 (20.3 percent) less than 12 months. Twenty-two (14.9 percent) had served over 1 year. Thirty gave a history of rheumatic fever prior to enlistment: this small number we attribute to the fact that a large proportion of the patients lived in the Southern states. Twelve had had an attack of the disease subsequent to enlistment, but prior to the present admission to the sick list.

ONSET

In 125 (79.1 percent) of the cases the disease began at a training station. Fourteen (8.9 percent) became ill while ashore, either on duty or on leave. Only 19 (12.1 percent) were attached to a ship when they became ill. Usually the vessel was in port, so the disease should be ascribed to the port rather than to the ship. Rheumatic fever may have its onset at sea, but in the only case with which the writer is personally familiar, the patient, a pharmacist's mate, acquired the disease as a result of attending a streptococcus carrier who recently arrived from the continental United States.

Accurate data regarding the infectious disease which preceded the onset of rheumatic fever were available in 116 cases, and were contained in the patient's Health Record, but in some instances the data were obtained from the patient's statements. In the remaining 42 cases, either there was no Health Record entry, the patient denied infection, or the history taking was at fault.

The most common precursor was, as might be expected, the group of upper respiratory infections usually regarded as streptococcic in origin such as: acute pharyngitis; acute tonsillitis; peritonsillar abscess:

scarlet fever; and acute otitis media. Together, these comprised 65 cases, or 64.6 percent of the number in which data are available. The Health Record described "Catarrhal Fever, acute" or else the patient stated that he had had a "cold," in 30 (25.9 percent) cases. A history of pneumonia was obtained in 7 cases (6.0 percent), German measles in 2 (1.7 percent), cerebrospinal fever in 1 (0.8 percent), and periapical abscess in 1 (0.8 percent).

It is likely that the diagnosis of acute catarrhal fever was generally inaccurate. In this hospital this diagnosis proves to be wrong in about four-fifths of the cases where it appears as the admission diagnosis. It was, therefore, probably a professional or lay misnomer for streptococcic pharyngitis. In some patients with pneumonia, rheumatic fever appeared concurrently, and in 1 patient bacteriologic examination of the sputum showed hemolytic streptococcus. Consequently, it is reasonable to suppose that the disease was streptococcic in other instances. We believe, as does Rosenberg (1), that German measles was coincidental with streptococcic infection, and the same may have been true in the case of meningitis. No explanation is offered for the dental abscess, although the chain of events in this case was clear.

It is of interest that scarlet fever accounted for 20 cases (17.7 percent) in the group. This is a higher incidence than is usually encountered.

CLINICAL FEATURES

With regularity, the histories described a migratory polyarthritides, affecting chiefly the joints of the lower extremities; heat; redness; swelling; pain; pain on motion; fever and sweats; and a prompt response to salicylates. The records, and our own observations, indicate that early admission to the sick list and prompt administration of salicylates modified the early stages of the disease. Weakness and pallor caused by the disease and immobilization in bed were common. In the majority of cases an apical systolic murmur was heard early in the course of the disease; but this usually disappeared. One patient had an aortic or pulmonic diastolic murmur (heard by several examiners) which vanished.

Without exception, the erythrocyte sedimentation rate was elevated in the active case. However, it usually descended to normal at the expected time. There were few cases in which prolonged elevation of this index did not herald a complication or sequela.

An electrocardiographic examination was made in all early cases; most patients had 2 or more such examinations. In 74 cases (46 percent) the tracing was abnormal at some time during the course. Disorders of conduction, usually first degree heart block, were the abnormalities most frequently observed and were present in 35 patients. "Myocardial damage," as evidenced by T-wave or QRS abnormalities,

occurred in 22 cases. In some patients both were present. Pericarditis was diagnosed by electrocardiogram in 3 patients.

TREATMENT

The treatment of rheumatic fever may be considered in three groups: rest and rehabilitation; sodium salicylate; and special measures for special indications.

The plan of treatment adopted at the U. S. Naval Hospital, Corona, Calif., was employed from the outset, and was applied as closely as local conditions permitted. This plan fitted exactly into the Rehabilitation Program of the Navy. Symptomatic patients were kept at bed rest on sodium salicylate medication. When demobilization reduced the number of Hospital Corps men to the point where prolonged bed rest was not feasible some symptomatic patients were permitted to walk to the head if they felt able. This compromise, forced by circumstances beyond our control, was theoretically undesirable, but seemed safe enough in the light of the report of Karpovich et al. (2). In fact, no ill effects were noted.

When a patient became symptom and fever free, he was allowed lavatory privileges as a regular matter. Salicylate dosage was maintained until 2 weeks after the return of the sedimentation rate to normal, at which time it was discontinued. If after 1 week no relapse occurred the patient was permitted up and about the ward as he chose, except for a rest period after lunch, and was assigned a light ward-work detail. Occupational therapy was emphasized. When weather permitted he was allowed to visit the nearby Ship's Service Store and the movies.

After 1 full month in this status, the patient was regarded as convalescent. He was fully ambulatory and was now assigned an outside rehabilitation detail suited, as far as possible, to his individual needs and attainments. After about 3 weeks, each patient's case was considered jointly by the chief of medicine, the ward medical officer, the intern, and any other interested medical officer. His history was reviewed and a physical examination was made to determine the presence or absence of sequelae. On the basis of the findings, disposition was planned. All patients, except two who were transferred to other hospitals before the completion of treatment, were brought before a Board of Medical Survey at the expiration of 4 weeks for final disposition.

In practice, considerable applied common sense was necessary in addition to rest and medication. The patients were active and young men whose primary indoctrination in the Navy was incomplete, and as they experienced the return of a sense of well-being, individual and group behavior problems arose. Disciplinary measures aimed at patients in bed or confined to a ward are idle, and constitute a negative

rather than a positive approach to the problem. In addition to occupational therapy, games, movies generously arranged by the Red Cross, and educational measures proved of most use. The educational measures took the form of talks by the ward medical officers, with the objective of explaining to the patients the reasons for prolonged hospitalization. A surprisingly large number of patients and their families, judged by letters received, had only a vague comprehension of the disease and its potential dangers. The talks served, therefore, in many instances, to allay unnecessary fears as to the outcome as well as to promote the virtue of patience. Each talk was succeeded by a temporary reduction in disciplinary cases.

The use of sodium salicylate in this hospital was based upon the position that this drug is a symptomatic and not a specific remedy in the treatment of rheumatic fever. In past years others have used cinchophen and amidopyrine alternatively in this disease with results fully comparable to those expected from sodium salicylate. Lichtwitz (3) has recently commented on their interchangeability and Rosenberg (1) used amidopyrine in a few cases.

The standard daily dose was 8 grams given by mouth with 4 grams of sodium bicarbonate. Intermittently since 1904 some workers have administered sodium salicylate intravenously (3); a sufficient length of time has elapsed for the method to become established had it any superiority. Warren et al. (4) found no advantage in the method. Since the Council on Pharmacy and Chemistry of the American Medical Association has long condemned the parenteral use of any drug which is effective by mouth, we saw no justification for subjecting the patients to the risks involved.

While sodium bicarbonate may impede the building up of a "blood level" of sodium salicylate when the two are given together, the use of sodium bicarbonate is customary for the prevention of gastric disturbances, a not inconsiderable factor in successful treatment. Therefore, we used sodium bicarbonate routinely. When the desired effect was not achieved by standard doses, the amount of salicylate was increased to 10 grams a day. This, in our experience, met the needs of the situation. Where gastric intolerance persisted despite the use of sodium bicarbonate, or when the patient refused to take his medicine, recourse was had to the rectal administration of 8 grams of sodium salicylate in warm milk each day. This procedure proved an effective means of combating both difficulties.

Two patients developed dermatitis medicamentosa as a result of taking sodium salicylate. In these cases the drug was temporarily discontinued, and later resumed in reduced doses without difficulty.

Although the response in the majority of patients was about as expected, there were some cases in which special measures had to be employed to meet special indications.

While pallor was common in patients confined to bed for long periods, actual anemia was found in only 4 cases. These were treated with ferrous sulfate, 0.6 gm. daily.

When a patient's progress was unusually slow, either clinically or as indicated by persistent elevation of the sedimentation rate, an investigation was made to determine, if possible, the cause. This was usually evident at the bedside, in the form of a rheumatic fever relapse, an intercurrent infection, or a chronic infection of the tonsils or pharynx. If none of these were present, the patient was referred for dental consultation.

When the tonsils, or in the absence of the tonsils, the pharynx, appeared to be chronically inflamed, hot salt and soda irrigations were prescribed. This often sufficed, and reduction of the inflammation was followed by a fall in the sedimentation rate. If this failed, tonsillectomy was considered, and this operation was done in 11 cases. An elevated sedimentation rate, in the absence of clinical rheumatism, was not regarded as a contra-indication. In 1 case the otolaryngological consultant recommended additional adenoidectomy. The results of these surgical procedures were satisfactory in that the sedimentation rates promptly returned to normal and convalescence followed. We are aware that tonsillectomy in rheumatic fever is frowned upon, and agree in the general proposition that it will not prevent recurrence, but believe that when indicated the operation is justified and, indeed, desirable.

In 5 cases, periapical dental infections were demonstrated. Appropriate extractions were carried out under penicillin prophylaxis with results comparable to those of tonsillectomy. In the opinion of the author the importance of dental infections in prolonging an attack of rheumatic fever is insufficiently emphasized.

COURSE

Our plan of treatment implied a minimum of 3 months on the sick list. Disposition was made in the majority of the cases within 4 months. Very few remained on the sick list over 6 months.

The problem of relapse in rheumatic fever remains unsolved. In some of our cases intercurrent infection or focal infection seemed to be the cause. In 4 cases overexertion while on liberty in the early convalescent stage was directly to blame. It is of interest that 4 patients, asymptomatic, but with elevated sedimentation rates, were allowed to go home on emergency leave because of illness or death in their families, and that in none of these did a relapse occur. From this it may be inferred that early unrestrained activity is more of a menace to the rheumatic patient than purposeful, restrained activity.

COMPLICATIONS

In this series the following complications arose: pneumonia, 5 cases; erythema annulare rheumaticum, 3 cases; erythema multiforme, 1 case; pericarditis, 3 cases; chorea, 2 cases; cyclitis, 1 case; nephritis, 1 case; subacute bacterial endocarditis, 2 cases; and valvular heart disease, 32 cases. All of them proved transitory and unimportant except for the two latter complications.

Subacute bacterial endocarditis, although it occurred only twice, presented a new urgency in diagnosis because of the fact that penicillin is an effective treatment for this complication (5). Formerly it was proper, when this disease was suspected, to await conclusive developments or a positive blood culture, but such a delay is no longer justifiable. One of the cases had been so diagnosed prior to transfer to this hospital on the basis of petechiae, heart murmur, palpable spleen, and hematuria. The other, while convalescing on our ward, developed spiking temperature, enlarged spleen, and a new heart murmur. In each case penicillin was administered despite negative blood cultures. Each patient received about 9 million units over a period of 4 weeks. Each rapidly improved and was subsequently discharged with the diagnosis, valvular heart disease. These cases are cited not as cures of bacterial endocarditis, but as examples of the changed point of view demanded by the advent of penicillin regarding this disease.

Valvular heart disease remains the most important complication of rheumatic fever. It arose in 32 cases (20.3 percent) of the series. In 1 patient it existed prior to enlistment. It is impossible to say that our other patients will not develop valve lesions in later years.

The lesions present at the time of disposition were: mitral stenosis and insufficiency, 6 cases; aortic insufficiency, 5 cases; mitral stenosis and insufficiency with aortic insufficiency, 6 cases; aortic stenosis, 1 case; and mitral insufficiency alone, 14 cases.

The diagnosis of mitral insufficiency alone is always insecure. We agree with Lewis (6) that the significance of an apical systolic murmur is that of the accompanying pathology. Nevertheless, the presence of a persistent, well-transmitted, apical systolic murmur in a patient just recovered from rheumatic fever cannot be ignored, and is, for naval purposes, significant. It would take some years of observation of each individual patient to clear up the point, and under the circumstances, establishing the diagnosis of valvular heart disease seemed justified.

In the development of valvular heart lesions, two factors were significant: history of previous attack; and electrocardiographic abnormality early in the course of the rheumatic fever. Of 44 patients with history of previous attack, 13 (29.4 percent) developed heart

lesions, while of the 114 patients without such history, only 19 (16.6 percent) developed valve lesions. Of 74 patients with early electrocardiographic abnormality, 18 (24.3 percent) developed valve lesions, while of 84 patients with normal electrocardiograms, 14 (16.6 percent) developed lesions. The probability of permanent cardiac damage is, therefore, somewhat greater in the patient suffering a recurrence of rheumatic fever, and in the patient with early electrocardiographic change.

CLIMATIC TREATMENT

Eight patients in this series who had had a previous attack of rheumatic fever in the Navy, had had the benefit of convalescent treatment in the far South. Recurrence followed within a few weeks of their return to duty. The locale of the recurrence was: a training station in six cases; a shore activity in one case; and aboard a ship in a Navy Yard in one case. As Swift (7) points out, convalescence in the Tropics is desirable, but recurrence upon return to the North is not unlikely and some loss of immunity may occur. Since rheumatic fever is an allergic response by mesenchymal tissue to bacterial infection (3), it is illogical to expect a sojourn in the Tropics to alter the diathesis. It is particularly illogical to expect the patients to remain well when returned to the training station at which their illness originated. Data on the general results of climatic treatment of this disease are not available, but these eight cases are cited to indicate that it is not always effective.

COMMENT

In observing these 158 patients, we were impressed with the fact that rheumatic fever in the Navy is largely a problem of recruits in the training station. It is indeed unfortunate that the Navy program for control of streptococcic infections by means of sulfadiazine (8), which appeared so successful in the winter of 1943-44, failed upon repetition. It is possible that some future program may solve the problem, and, by reducing streptococcic infections, sharply reduce the incidence of rheumatic fever. In the meantime, control measures must consist of the time-tested and simple provision of sufficient space and air per man in barracks and aboard ship (9). Since each patient discharged from the service because of the crippling effects of rheumatic fever will easily cost the Government several thousand dollars, to say nothing of the suffering, invalidism, and early death of the patient, it is false economy as well as poor hygiene to crowd recruits.

SUMMARY

1. In a series of 158 cases of rheumatic fever in naval patients the etiological role of streptococcic infection is emphasized.

2. An incidence of 20.3 percent of valvular heart disease was noted.
3. Climatic treatment failed to prevent relapse in eight cases.
4. The necessity of simple hygienic measures for prophylaxis is emphasized.

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Navy Medicine Beyond the Seas and on Safari^{1 2}

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WHEN I entered the Medical Corps of the Navy 26 years ago, it was with an attitude of some misgiving lest I find the practice of my profession limited in scope and my associates seriously restricted in their professional stature. While in that day a service doctor was not uncommonly thought of as an ambitionless sort of a soul, experienced only in treating venereal disease, and while even today the concept held by some in high places is that this is about all he needs be, I want simply to say that I soon found distinctly to the contrary, that my concern was ill-founded, and that such a concept should still be alive is reprehensible, to say the least. In fact, 26 years ago I came quickly to find the quality and quantity of knowledge possessed by Navy doctors by and large to be little short of amazing. The explanation for this was by no means obscure and is fundamentally twofold in its essence. First, by reason of the wide variety of independent duty the Navy doctor has been called upon to perform through the years it has behooved him to be versatile and liberally informed. Second, because of the fact that up until relatively recent years at least, he was required to pass a comprehensive examination each time he came up for promotion, the Navy doctor has been prompted to keep professionally sharp.

What, other than the necessity of preparing for an examination every so often, would impel the average physician to learn the life cycle of the malarial parasite, or even that of so common an invader as an ascaris? What general practitioner, save one who had served in the Army or Navy, would know the names and classification of the various flukes, such as those which have operculated eggs and are hermaphroditic and those with nonoperculated eggs and are not hermaphroditic?

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The order a Navy doctor of the old school was expected to fill made it necessary for him to be a general practitioner, a surgeon, a psychiatrist, a dermatologist, and syphilologist, a GU as well as an orthopedic expert, a hygienist of the industrial class, and in several more definitive fields such as submarines, and finally, but perhaps most important of all, the Navy doctor was, and is expected to be, an epidemiologist. In all these categories he has been wont to perform in a commendable manner and, besides keeping professionally competent it is incumbent upon him to keep physically fit as well. In fact, it has for some time been my contention that the requirements of service doctors are so highly specialized on one hand, so general on the other hand, and so exacting upon both, that they represent a specialty group unto themselves and are altogether deserving of being accepted as such and identified by a specific specialty board. Thus would this splendid and most worthy group of doctors be accorded dignified, pleasing, and fitting recognition.

It was because of the failure on the part of the medical schools of the Nation to place sufficient emphasis upon preventive medicine, and certain diseases belonging to that group ordinarily referred to as tropical diseases, in their undergraduate curricula, that the Naval Medical School was established over 50 years ago. The indifference toward recognizing the importance of epidemiology and preventive medicine in a large number of our medical schools even now is, to me, amazing. Today almost one-third of the medical schools of the country do not include public health in their curricula. In any event, the Navy long ago recognized the necessity of familiarizing its doctors with the paramount importance of preventive medicine, and of providing special training in the management of particular diseases with which its doctors might be called upon to deal in the far-flung corners of the earth and for which their preparation in their regular undergraduate courses had been insufficient.

The sphere of activity of the U. S. Navy in time of peace, has, for many years, been world-wide. Navy staffed shore stations beyond the seas, prior to World War II, were numerous and widely scattered. Most of them, however, were in subtropical and tropical latitudes. In the light of our victories in World War II and a consequent increase in our stature as a world power, there seems little likelihood that the sphere of operations of the Navy will become restricted. At present 30 percent of the operating strength of our Medical Corps is serving either at sea or at foreign stations. Today, Navy doctors are stationed at about 25 shore stations beyond the continental limits of the United States. These stations range all the way from Greenland to Samoa, and from Cairo, Egypt, to Tsingtao, China. We still have a few doctors in the Philippines.

The Navy has Medical Department complement in the numbers indicated at the places listed in table 1.

TABLE 1.—*Medical Department personnel*

Activity	MC	DC	MSC and HC	NC	HM	Total
Guantanamo.....	12	5	10	8	118	153
Panama.....	17	3	9	13	108	150
Trinidad.....	5	1	2	5	25	38
Bermuda.....	2	2	0	5	9	18
Newfoundland.....	2	2	1	5	23	33
Port Lyautey (French Morocco).....	2	1	0	0	8	11
London.....	4	1	1	1	12	19
Japan (Yokosuka).....	7	3	2	8	35	55
Samoa.....	6	1	4	7	23	41
Athens (Greece).....	4	0	0	0	6	10
NAMRU-3, Cairo.....	6	1	5	0	23	35
Hawaiian Islands.....	38	24	20	51	370	503
Midway.....	2	1	0	2	9	14
Guam, Marianas Islands.....	58	13	32	47	379	529
Survey Ship—Pacific.....	2	1	1	0	7	11
Aleutians.....	9	4	2	6	86	107
Puerto Rico.....	6	2	2	5	28	43
Brazil.....	2	0	0	2	4	8
Peru.....	1	0	0	0	0	1
Tinian.....	1	0	0	0	4	5
Kwajalein.....	2	1	2	2	14	21
Saipan.....	5	1	4	4	18	32
Philippine Islands.....	4	2	3	5	29	43
Turkey.....	1	0	0	0	0	1
Total.....	198	69	100	176	465	2,265

The naval medical unit at Cairo, Egypt, was established as a sequel of a typhus commission which was sent to Egypt and was sponsored by the Navy during the late war—that is, between the years 1942–45. The laboratories set up and first operated in the Abbassia Fever Hospital in Cairo have continued to be operated as the Navy's Medical Research Unit No. 3, commonly known as NAMRU-3. From the time of its inception the Royal Egyptian Government has shown the greatest interest and friendliness in this venture. Much is to be gained here for science, for humanity, and for international relations. The fundamental function of this unit is to study the genesis, spread, and vectors of diseases indigenous to that part of the world along with the control and treatment of such diseases.

At present in Guam we maintain a Naval Medical Center which consists of a naval hospital, a Guam Memorial Hospital for natives, 3 dispensaries, a supply depot, and 3 schools for natives (1 for nurses, 1 for medical assistants, and 1 for dental assistants). At this time the Navy has 58 doctors, 13 dentists, 32 Medical Service Corps and Hospital Corps officers, 47 nurses, and 379 Hospital Corps men on the island of Guam. The Navy moreover maintains a leper colony on the island of Tinian. There are at present 107 lepers there and 1 Navy doctor. During the years immediately prior to the war, Guam was a doctor's paradise.

For the past year and a half a small group of Navy doctors have been carrying out a health survey of the mandated islands of the Pacific. For this purpose a ship has been fitted out which serves as a floating laboratory and an x-ray department. The complement of the ship comprises 8 officers and 38 enlisted men. Of this number, 2 are medical officers, 1 is a dental officer, 1 Medical Service Corps officer, 8 Hospital Corps men, and 1 Dental Corps man. It is the aim of this survey to study the health conditions as they relate to upwards of 100,000 individuals located on approximately 150 islands which dot 2,000,000 square miles of the Pacific Ocean. It is the intent of this survey to determine:

1. The incidence of TB.
2. The incidence of helminthiasis.
3. The incidence of yaws.
4. To seek out lepers for control and segregation at a leprosarium.
5. To study and implement insect and rodent control.
6. To check and remedy water supply and sewage disposal.
7. To acquire vital statistics and establish better methods of keeping records.
8. To uncover epidemiological and medical care problems.
9. Gather significant data regarding local customs and taboos which might become important in instituting a program of health education.

In Samoa, during the occupation of that island by our troops early in the Pacific campaign of World War II, certain manifestations of filariasis became evident among our Navy and particularly among our Marine forces there. This caused considerable concern and, indeed, alarm on the part of some. Naval medical research, however, soon uncovered the factors responsible for the inordinate show of early signs of filariasis or mumu, and advanced the prophecy which has turned out to be bona fide, that if individuals were removed from the territory early and were not subjected to repeated infections, that elephantiasis would not develop. Out of 14,009 cases of mumu recorded during World War II, not a single case of elephantiasis has as yet become manifest.

In Japan, following the atomic bomb explosions at Hiroshima and Nagasaki, a Navy mission studied the early, and have subsequently studied the late, effects of atomic radiation. Navy doctors are at present stationed in Japan, in the Aleutian Islands, and on the mainland of Alaska. Members of the Naval Medical Corps and of the corps ancillary to medicine have accompanied expeditions to the Arctic and Antarctic regions in order to study the effects of cold and to become acquainted with special considerations relevant to naval operations under conditions of extreme cold.

At one time since the war the Navy had several doctors in Germany. A very fine piece of work was performed by Navy doctors in Heidelberg in the translation of a great deal of literature dealing with submarine medicine. Considerable translation was done from the German literature upon a number of medical matters, particularly in the field of orthopedic surgery. One such item was that which described the Germans' development and use of the intermedullary bone peg.

I now come to comment upon a mission I had a hand in organizing and implementing and which recently came to its completion. It was one of the most unique missions ever accomplished, I believe, by Navy doctors. I refer to the research mission which accompanied a University of California sponsored Archeological Expedition to Africa.

In August of 1947 the Navy was requested to provide medical coverage for this expedition. Since I had not long previously been in command of the Naval Medical School at Bethesda, I was aware of our inadequacies in the nature of teaching material at our school and of the lack of information with respect to a number of diseases more commonly considered tropical diseases and most particularly, with respect to several such diseases that are indigenous to Africa.

Therefore realizing that here was a golden opportunity for the Naval Medical Corps to obtain some badly needed information, I prevailed upon the leader of the expedition, Mr. Wendell Phillips, to permit the Navy to send along, not only one doctor, but a research unit consisting of several doctors and specialists in the sciences allied to medicine.

This outfit equipped with its own trucks, jeeps, and all manner of paraphernalia, including radio and photographic equipment, and a young arsenal of guns and ammunition, got under way from Port Said early in 1948 and for the ensuing year forged ahead in the face of obstacles of one kind or another which, at one time or another, appeared insurmountable, until finally it reached Capetown, having en route covered over 15,000 miles in Africa. Their itinerary even extended to Madagascar, and upon their return to the United States by surface vessel the east coast of South America was traversed from Buenos Aires northward. The aggregate number of miles traversed from start to finish of this safari totaled 37,000. The net result of this expedition was the collection of a wealth of medical information including museum and laboratory specimens, the like of which had never been brought out of Africa by any previous similar expedition.

In any event, here once again is illustrated how the Medical Corps of one of the Armed Services, upon its own initiative, can make contributions of inestimable value to the general store of medical knowledge, and here once again was an achievement which should go a long way toward dispelling the idea extant in the minds of some that the sphere

of interest of service medicine is limited. Nowhere, in fact, is there to be found a broader and more diversified field of medical interest and opportunity than in the Medical Corps of the U. S. Navy, Army, and in due time, the Air Force will, no doubt, be in a comparable class medicine-wise.

The undertaking of which I relate was accomplished despite numerous obstacles. One such obstacle was that which accrued from the persistent accusations, on the part of petulant minorities in the various nations or provinces visited, that here was in Africa a cadre of wolves in sheep's clothing. Here was a band of spies marching under the guise of medical scientists but actually engaged in surveying the continent of Africa to determine the best locations for air fields and to take account of preliminaries incident to setting up Africa as the staging area for World War III. In other words, the very fact that these were Navy people was regarded as a subtlety. It was contended that if they had belonged to the Army or Air Forces their mission would have been too obvious.

Although the preeminent purpose of this Navy group of doctors and devotees to sciences pertaining to medicine was purely and simply the acquisition of scientific knowledge and the collection of a variety of specimens of medical value in the broadest of humanitarian interests, and the fallacy of these allegations to the contrary notwithstanding, it is freely admitted that in case Africa should become important as a staging area for the next war, the information of general as well as that of medical value recently obtained by the Navy's group would prove of inestimable importance. It could indeed mean the difference between security or chaos, in terms of lives lost or troops rendered ineffective by disease. Therefore, the advantage which could be realized from our having seized opportunity by the forelock in this instance, could prove to be monumental.

I shall refrain from relating in detail the invaluable accomplishments of this mission to Africa. I will only say that the collection of specimens obtained includes a number, I am informed by reliable authority, that are not possessed elsewhere in the world. The largest native animal brought back alive was a lemur from Madagascar.

An accomplishment of this mission which attracted considerable newspaper publicity, was the capture and transportation by air to this country of over 100 elephant shrews. The "elephant" qualification carried the inference that this animal was elephantine in size. Actually it is smaller than our chipmunk and can be held in the palm of one's hand. The only similarity between this animal and an elephant is that the shrew has a long mobile proboscis that slightly simulates an elephant's trunk. The shrew is of importance because it was found in 1913 by some German scientist to harbor a type of

malarial parasite similar to human malaria. It has been reasoned that it might actually provide a reservoir for human malaria and, in any event, that it would provide a valuable laboratory animal for testing antimalarial drugs, inasmuch as the type of malaria it was known to harbor closely enough resembled human malaria to respond to antimalarial therapy similarly as does human malaria. This is perhaps all I need say with respect to the Navy's African Safari.

It would be readily apparent from what I have stated, I believe, that acceptable and interested personnel may find the activities of the Medical Department of the Navy beyond the seas to be wide in scope, diversified in variety, and extremely engaging in character. I want to say here that the administrative heads of the Medical Department of the Navy do not by any means direct their interest in the Navy's far-flung medical activities solely from swivel chairs in the Bureau of Medicine and Surgery. The Surgeon General has personally visited practically every naval medical activity beyond the seas regardless of its size. The General Inspector visited most of the stations of the Pacific and Japan in company with the Surgeon General last fall. The incumbent district medical officer of the Third Naval District, was for nearly 2 years the Navy's senior medical representative on the island of Guam. There is at present a Medical Corps Flag Officer in the Hawaiian Islands.

The General Inspector of the Dental Corps during the past 6 months, visited all of our stations in the Caribbean area and all of our trans-Atlantic activities where dental officers are stationed. Very recently the Assistant Chief of the Bureau for Research and Medical Military Specialties made a tour of inspection of all our trans-Atlantic stations. Last summer, by reason of my position in the Navy, I had the good fortune to fly 116½ hours on 16 out of 19 days, for a total of 23,000 miles to Nairobi in Kenya Province, British East Africa, and return via North Africa and Europe, in connection with the African mission upon which I have commented. That was my most recent first-hand participation in the implementation of the interests of Navy medicine beyond the seas.

And what does all this add up to? It adds up to the incontrovertible fact that the Medical Department of the Navy is a major league organization. And I want it to remain that way. Anything less than the best would be incongruous with the Navy it serves. Anything less than the best Navy in the world would be incongruous with the nation to which it belongs. The Armed Forces have, during this postwar period of reconstruction, been subjected to a great deal of critical scrutiny. One would think we lost the late war. Many faults have been found and many recommendations have been made. I am particularly aware of the criticism that has been leveled at the

Medical Departments of the Armed Forces. Some of it has been justified and some of it just ridiculous. We know we are not perfect; many faults have been recognized and many corrective measures have been, are being, and will continue to be instituted.

In any event, I do not feel disposed to apologize to anybody for the Navy's Medical Department. I know that there are some high in the medical world who do not think it would be possible to ever make the Medical Departments of the Armed Services attractive. They have publicly so stated. I think this is so wrong as to incite a feeling of pity.

Recently at a conference in the office of the Surgeon General of the Navy in Washington, the medical officer who organized and led the medical unit of the African expedition I have just referred to, gave a report upon the accomplishments of that expedition. There were some 25 or 30 members of the Medical Department of the Navy present. As I sat there and listened to this officer relate the fascinating highlights of his African mission, I began somehow to cogitate upon the stature and ability of the members of my profession who wear the uniform of the Navy and to note the variety and caliber exemplified by that particular group. To start with there was present one of the most youthful and energetic Surgeons General the Navy has ever had. For professional competence he is superb in his field. One of the Navy's most travelled officers, he has been the recipient of perhaps more diplomas, certificates and awards of one kind or another than any Surgeon General the Navy has known. There in that group sat two officers, one an Admiral in the Medical Corps and one an Admiral in the Dental Corps, who had been All-American football players. There sat a surgeon who did pneumonectomies in his operating room in Philadelphia before the American Board of Surgery was ever heard of. Present there was a flag officer of the Medical Department of the Navy who was the first member of his corps to become a commissioned aeroplane pilot in the Navy's Air Force. There was the medical officer of the ship whose scuppers ran red with the blood of its crew and who himself was seriously wounded in perhaps the most vicious enemy attack to be survived by any ship in the American Navy during World War II or any other war. There was, wearing the insignia of the Medical Department of the Navy, one of the Nation's foremost authorities on radioactivity and its medical implications. He is, in fact, at present editing the first textbook to be published on "Atomic Medicine" and, incidentally, all of the contributors to that book are wearing or have at one time worn the uniform of the Navy. There was in the audience one of the world's best informed medical authorities on submarine medicine who supervised the rescue of 33 submariners from the submarine *Squalus* in May 1939.

One of the medical officers present held a degree in civil engineering before he entered upon the study of medicine. As a participant in the Bituminous Coal Survey, made by the Navy, the Navy's Typhus Commission to Egypt in World War II, and the recent African expedition, his role would be regarded as stellar in any league.

Sitting directly in front of me during the conference to which I refer there was the medical officer of the Navy's most famous ship, the *Missouri*. This individual is distinguished, however, not for being the medical officer of the *Missouri*, but insofar as I know he is the only doctor, if not the only man in the Navy to have reached up and seized a piece of rope dangling from a helicopter and allowed himself to be transported over a considerable strip of water to be deposited upon the deck of another ship. Some of you may have seen a picture of this unique method of transportation on the front cover of a recent issue of the NAVAL MEDICAL BULLETIN. And incidentally, for those of you who may be interested I might say that the NAVAL MEDICAL BULLETIN has the second largest circulation of any medical publication in North America. Its circulation is exceeded only by the *Journal of the American Medical Association*.

There were present there in that room 10 Diplomates of American Specialty Boards. Several were certified by more than one board. The first medical officer in the Navy to become a Diplomat of the National Board of Medical Examiners and the first to become certified by the American Board of Surgery the hard way was among those present. Several wore Alpha Omega Alpha keys; two were wearers of the Distinguished Service Medal of the Navy in recognition of extremely meritorious service performed during World War II. A number wore medals of merit ribbons. One of the medical officers present in that group was for years and perhaps still is, the Navy's most decorated officer. Having since World War I worn the Nation's highest military decoration, the Congressional Medal of Honor, and having served as the personal physician to three Presidents and as a member of many important commissions and committees; he bears the mark of distinction upon more counts than any other member of his Corps. I refer, of course, to the incumbent President of the Association of Military Surgeons.

I could continue this recount of achievement and merit on and on. Suffice it, however, to say that if I did no more than comment upon the man conducting the presentation attended by the group referred to, the point I am in process of making would be amply illustrated, for that individual, during World War II, was responsible for the implementation of a program which conserved more manpower and perhaps saved more lives than all the surgeons in the Armed Forces combined. I refer to the individual who was in charge of the Anti-

malarial Control Unit in the South Pacific. Under his direction there were 80 officers and 450 enlisted men. The health and welfare of a quarter of a million shore-based forces were the responsibility of this officer.

Under his expert management the malarial rate on the island of Efate dropped from 2,600 cases per 1,000 men per year to 83 cases per 1,000 men per year. Between August 7, 1942, and February 8, 1943, on the island of Guadalcanal, 60,000 United States troops came down with malaria which resulted in the loss of 1,000,000 man-days. During that period enemy bullets accounted for 104,781 man-days or a ratio of 10 for malaria to 1 for bullets. Following the institution of anti-malarial control measures under the direction of this officer, malaria in Guadalcanal was reduced from 1,800 cases per thousand men per year to 70 cases per thousand men per year. The presence of so many noteworthy individuals in this group was entirely coincidental and was fairly representative of the Navy's Medical Corps by and large.

Now what is the point I am in process of making? The point is that all of these individuals to whom I have referred, with one exception, are regular members of the Medical Department of the Navy. They must have found the service attractive. In fact, their mere membership in it lends to their Corps a singular attractiveness for which there is no substitute. In other words, good doctors, like good football players, want to play on first-flight teams. In order to hold such men the service must be kept attractive. It is personnel of the caliber of those to whom I have referred that makes the Medical Department of the Navy an organization of capital quality. And if it were not of major league stature and did not contain doctors, dentists, nurses, Medical Service Corps personnel and corpsmen of the highest order, it would distinctly devolve upon somebody to do something about it. It is vitally important that the Medical Corps of the Navy contain men of the competence cited, available to spring into action upon sudden summons. This kind of commodity cannot be kept in moth balls, or in cold storage, or be farmed out.

As for myself personally, I merely want to say that, as is true of any similar proposition, I believe one will gain from a career in the Medical Corps of the Armed Services commensurately as he puts into his work. The Navy has been wonderfully good to me. It has enabled me to travel in all continents and upon the waters of all the oceans of the world and while circumnavigating the globe, to visit in the palaces of the high and mighty and to rub elbows with princes and potentates. To have realized comparable experiences as a civilian, I would first of all have had to be a millionaire. Indeed

I have found my Medical Corps so attractive for 26 years that to me, not to have joined the Navy would have meant simply a failure on my part to do the particular thing in my life I now hold in most grateful reflection.



The Plans and Present Status of the Naval Medical History of World War II

LOUIS H. RODDIS, *Captain (MC) U. S. N.*¹

IT HAS long been the custom of many governments to publish official histories dealing with the operations of their military forces during war periods. One of the earliest of these official military histories were the dispatches and reports of the Duke of Wellington which formed, in effect, a documentary military history of much of the Napoleonic Wars. The German Government published an extensive history of the Franco-Prussian War. Our own Government printed an elaborate and famous history of the Civil War. Similar histories were prepared and published for the Spanish-American War and World War I. Very voluminous medical histories of the Civil War and of World War I were also published by the Medical Department of the Army.

On 4 March 1942 President Roosevelt issued a directive that all important Government agencies would make arrangements to prepare and publish an official history of their participation in the war. A number of civilian agencies particularly associated with the war effort were also urged to prepare similar narratives. In accordance with this directive, the Navy Department established an Office of Naval History, and a history of naval operations and of the various administrative features of the Navy Department during the war are now being published. All offices and bureaus of the Navy Department are also engaged in the task of preparing official narratives of their part in the war.

The Bureau of Medicine and Surgery has established a Naval Medical History and Museum Branch, which is concerned not only with the official naval medical history of the war, but also with naval medical history in general. Plans have been prepared to write and publish a pictorial and professional history of the part played by the Medical

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Department in World War II. These plans include a selection of suitable authors, the preparation of a prospectus, the size and scope of the work, and an estimate of the budgetary requirements and times of publication.

Under the present plans the Naval Medical History will consist of the following:

(a) A pictorial volume which, with captions and an introductory or connecting narrative, will give a general pictorial history of the activities of all parts of the Medical Department in World War II.

(b) Two or possibly three volumes dealing with professional subjects, such as preventive medicine, fractures, wounds, burns, tuberculosis, and, indeed, all the subjects usually dealt with by the various medical and surgical specialties. There will be as many as 80 or 90 monographs dealing with these special subjects. Authors for most of these monographs have been selected. A few of the monographs have already been written, and many others are in the process of preparation. Because it may be some time before these monographs can be printed in a bound volume, it is contemplated that a number of them will be published in advance of their inclusion in the regular printed book. This will give earlier access to material of special interest. It is hoped that the printed volumes will be ready by 1951 or 1952.

(c) A statistical volume is contemplated, containing all the important statistics dealing with the various diseases and injuries for the entire war period. This will include a summary of all the diseases, and of noncombat injuries, as well as combat casualties, and short special studies of important groups. These studies will be in the nature of an analysis and interpretation of statistics of special value and importance.

(d) Finally, it is planned to publish a small memorial volume to consist of a list of all members of the Medical Department of the Navy who were killed, wounded, or died of disease while on active duty during the war. It is also planned to have in this volume a list of all members of the Medical Department who received citations and awards. A copy of this volume is to be given to each member of the Medical Department whose name appears in it, or if he is not living, to his next of kin.

Considerable interest has been manifested in when the history will be finished. For the first time since the war it has been possible to actively carry on work on the Naval Medical History. Sufficient progress is being made so that some idea can be formulated as to the length of time to complete it. It is probable that 1951 or 1952 will be the earliest date that the history can be completed and appear in print. The first volume, the pictorial history, it is hoped, will appear

in 1950. The volumes on professional subjects, however, will appear later. In part, their completion depends upon the cooperation of the authors of the various monographs; and the exact time, therefore, is somewhat difficult to predict. It is believed, however, that 1951 or 1952 will see the publication of these volumes. The statistical volume, it is also hoped, will be ready in 1950. The memorial volume should also be completed in 1950.

The tentative size of the book and the type of binding contemplated have also been the subject of considerable thought. A volume of about the standard professional-size page, approximately that of the **NAVAL MEDICAL BULLETIN** has been considered to be most desirable. The type and paper used in the **BULLETIN** will also probably be used. This is a clear legible type, and the paper is such that illustrations can be splendidly reproduced upon it. It is intended that the cover of the book will be of navy blue with lettering in gold. Of course, the volumes will have suitable introductions and prefaces, with forewords by the Secretary of the Navy, the present Surgeon General of the Navy, Rear Admiral C. A. Swanson, and also by Vice Admiral Ross T McIntire, the wartime Surgeon General.

One of the most important features in preparing this history has been the selection of the authors for the different parts. The greatest care has been exercised here, and a great deal of attention has been given to selecting people who, not only because of their professional knowledge but because of first-hand experience with the subject in the Navy during the war, are best qualified to write on the subject. When selected, each author has been requested by the Surgeon General to prepare the monograph. The authors are allowed considerable latitude in dealing with their subject. They are given a general idea of the amount of space allotted to them, after which they are permitted to prepare the material in their own way, and with such illustrations as they see fit to use. In general each author may present his subject with a minimum of restrictions or editorial revision.

The only reward the authors receive is the honor and prestige of being selected for the task and the satisfaction they themselves receive from performing it. In every instance the writers selected are busy people, actively employed in professional work; and the preparation of a section of the Naval Medical History is merely an additional task to them. Yet in nearly every instance the authors have cheerfully accepted the work and manifested great interest in it. It is expected that each author will receive from the Surgeon General an appropriate letter of appreciation, which can be filed on his official record in the case of officers of both the Regular Navy and the Reserve. This is practically the only recompense which can be classified as really tangible.

The historical branch established in the Bureau of Medicine and Surgery includes the term "Museum." In other words, it is the Medical History and Museum Branch. We have received a number of inquiries, and a great deal of interest has been shown in the duties of the Museum Section of the Branch. For a considerable period of time, a number of plans have been advanced for the building in Washington of a national naval museum. The Naval Historical Foundation has been especially active in recommending the establishment of a naval museum in the Capital. It was hoped that a building would be erected on the Mall facing the river with piers in front of the building. At these piers would be anchored historic ships, such as the U. S. S. *Constitution*; *The Niagara*, Perry's flagship at Lake Erie; *The Hartford*, Farragut's flagship at Mobile Bay; *The Olympia*, Admiral Dewey's flagship at Manila Bay; and some notable ship of the World War II period. Other vessels of interest, including small craft, might also be moored at these piers. The building on the Mall would have wings in which each Bureau and Office of the Navy Department would have exhibits and displays showing their special activities and designed to interest and instruct the general public. In such a museum, of course, the Bureau of Medicine and Surgery would have a place. The Museum Branch is concerned with the collection, preservation, and description of objects of importance in the History of the Naval Medical Department for possible future display in this museum or in any other suitable place.

A collection of documents and narratives covering the administrative history of the Bureau of Medicine and Surgery and the Medical Department of the Navy during the war was made by the Administrative Division of the Bureau, and a number of copies of this have been reproduced and distributed to naval hospitals and to some Government agencies to which it might be of interest.

A narrative history, which would give the detailed experiences of each unit of the Medical Department of the Navy during the war, would be of interminable length if it were to fully cover the subject. A single narrative volume might be written that would give a bird's-eye view of naval medicine during the war; but this is probably better presented by the projected pictorial history volume, which will cover the subject in a more graphic manner than a written narrative. The fact that it is impracticable, both because of expense and the time involved, to produce a huge 10- or 20-volume official narrative history, offers certain advantages and opportunities to many members of the Medical Department of the Navy who took part in the war. It offers a field for individual historians to deal with the various groups and to write separate histories giving the details of organization, movements, combat experiences, and work of the various medical units. As an

example, there has already appeared a narrative history of the hospital ship *Solace*. As time passes, more and more of this type of historical material will undoubtedly appear in articles or books and will form a useful supplement to the official history.

In conclusion, a word on the value of any history may be worth while. Aside from man's perennial interest in the record of his acts individually and collectively, a history of the past provides a guide for plans of the future. One of the great men of our generation has stated it exactly by saying that to look ahead one has to first look back. All planning for the future is in a great degree dependent on the lessons of the past, and those lessons will be found in the pages of history. What one might call "practical history" can result in an actual saving of money, time, and human life. The development and use of typhoid vaccination, that has saved countless lives, came from a study of the lessons of the Spanish-American War of 1898 and the South African War of 1899 and 1901. Tetanus, an even greater killer in war than typhoid, was almost completely conquered in World War II. This again was due in great part to lessons learned from the study of tetanus in World War I and the research that led to the development of a successful tetanus vaccine.

The need for authentic information on naval medical history alone is seen by the numerous inquiries received, not only from Government agencies but from organizations and individuals both in the United States and other countries. The questions asked are often of vital importance to the questioner, and yet the answers cannot be given unless the historical record is available.

The question has been raised as to the reliability of official histories. There is a feeling on the part of many that the successes are given ample space but the failures are omitted or glossed over. It is true that in a court of law an individual is not expected to convict himself from his own testimony, nor will a Government perhaps be expected to place in a historical record the entire story of its own errors. However, it may be said that official history is certainly as reliable as any other, and the official histories which have been produced in the past have been prepared in a painstaking and conscientious manner and the record of events set down in as clear and impartial a manner as possible. This is undoubtedly true of the official histories now being prepared by the Army, Navy, and Marine Corps; and it is certain that the authors of the Naval Medical History of World War II will give a true account of their experiences. Of particular importance will be the statistical volume, which will give ready access to the most authentic statistical information on disease, injuries, and battle casualties during the World War II period.

The Rubber Dam in Operative Dentistry

GLENN W. BERRY, *Captain (DC) U. S. N.*

THE sole purpose in publishing this review is to stimulate the use of the rubber dam by naval dental officers. Clinical experience of the Dental Department at the Naval Air Station, Seattle, Wash., substantiates this article as published.

The introduction of the rubber dam into dentistry by Dr. Sanford C. Branum, of New York, in 1864, resulted in great improvement in the technic of dental operations (1).

Exclusion of the secretions of the mouth from the field of operation and the production of absolute dryness are essential to the correct performance of most procedures in operative dentistry. Moisture may be more readily and perfectly excluded with this adjunct than through the use of absorbents. The use of the latter should, as a rule, be confined to operations on the soft tissues of the mouth and to very short or simple procedures on the hard structures (1).

Saliva contains many varieties of micro-organisms, food debris, and material of a fermentable or putrefactive nature, capable of producing caries and discoloration of tooth structure. It will, in many instances, produce discoloration under and around restorations. The mucin content of saliva if allowed to come in contact with the walls of cavities, forms an indistinguishable film which, if allowed to remain, prevents perfect adaptation of filling materials and later offers a ready moist medium for bacteria. Dryness is essential in amalgam work, since moisture destroys or changes the characteristics of this material (1).

The application of the rubber dam is, in possibly 95 percent of cases, one of the easiest technical procedures which the dentist performs. Like most other clinical services, it requires knowledge of the principles and fingers experienced by training (2). Many operators seem to have, in the beginning, a natural timidity in regard to its application and are prone to dispense with it on that account. Frequent practice in its use will eliminate this feeling and result in its efficient application (1). In most cases the rubber dam should be

fully adjusted in less than 3 minutes. The technical procedures for application of the rubber dam are thoroughly described and illustrated in textbooks of operative dentistry.

The rubber dam is in reality a time-saver, since the slight additional time required for its application is, in the majority of cases, overbalanced by the elimination of the troubles, inconveniences, and seepage of moisture which frequently occur during the use of absorbents (1). With a dry operating field the continued uninterrupted view permits continuous work by the dentist. He does not have to wait for the patient to expectorate, make a few remarks, and leisurely resume a position in the chair, often not the position desired by the dentist. The operator will also be saved the necessity of drying the cavity after each flooding. All this takes valuable time, much more than is required to adjust a dam (4).

The use of the rubber dam is absolutely essential in the execution of fine operative dentistry. Even the best operators cannot hope to produce a tight, subgingival margin without the use of the rubber dam. Routine bitewing x-rays prove this point adequately. It is difficult to understand why operators continue to labor under the squirt and spit method, continuously changing cotton rolls with fingers steeped in oral secretions, and working in the dark, when a 2½- or 3-minute application of the rubber dam would eliminate all these inconveniences (3).

The application of the "dam" is so simple that its lack of use seems ludicrous. Let's do the thing properly as advocated by G. V. Black and enjoy the thrill of seeing a gingival margin (2).

SUMMARY

The rubber dam is simple to apply; permits a dry field of operation; is a time saver; provides better visibility of the operative field; eliminates contact of operator with the oral secretions; and permits execution of fine operative dentistry.

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Matrix for the Seqveland Retainer

JESSE E. OWENS, *Lieutenant (DC) U. S. N.*

THE Seqveland matrix retainer is widely used throughout dental activities of the Navy. The steel matrix strip which is available from naval medical supply depots is one-eighth of an inch wider than can be utilized in this type retainer. This necessitates measuring, marking, and cutting the strip from three-eighths to one-fourth of an inch and requires considerable time. A great deal of time and effort may be saved in obtaining the correct width by making a few simple changes in the standard Navy matrix strip holder. The changes which can be made in a few minutes are listed below:

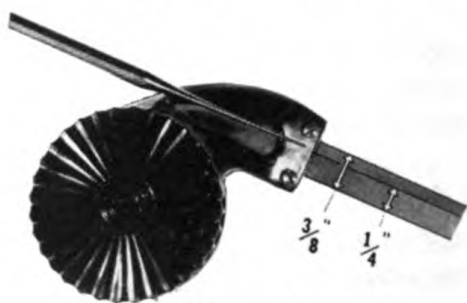


Figure 1.

(a) Drill two small holes of any convenient size for machine bolts through the 2 lips of the holder. These must be drilled so that the inboard edges of the holes are three-eighths of an inch apart in order to allow the steel matrix strip to pass between the bolts. The machine bolts, which are passed through these holes, will

act as guides for the steel strip and prevent the strip from slipping to either side.

(b) The roll of steel matrix is so placed that the end extends out through the lips of the holder.

(c) The two small machine bolts are secured through the two lips of the holder.

(d) A small hole is drilled through the upper lip of the holder with a No. 33½ inverted cone or a No. ½ round bur. The hole is drilled one-fourth of an inch from one of the bolts.

(e) With the left hand, hold a No. 17 explorer point through the hole which was drilled by the bur. Hold the explorer point firmly against the steel strip.

(f) With the right hand, pull the desired length of steel strip from the holder. The explorer point will leave a neat straight line in the steel matrix (fig. 1), which can be used as a guide to cut the steel matrix strip the proper width for use in the Seqveland retainer.

Hemophilia

Report of a Case

JACOB J. ROBBINS, *Lieutenant Commander (MC) U. S. N.*

THIS case of hemophilia offers an opportunity to review the literature concerning the newer theories of blood coagulation and the technique and limitations of the clotting time determination.

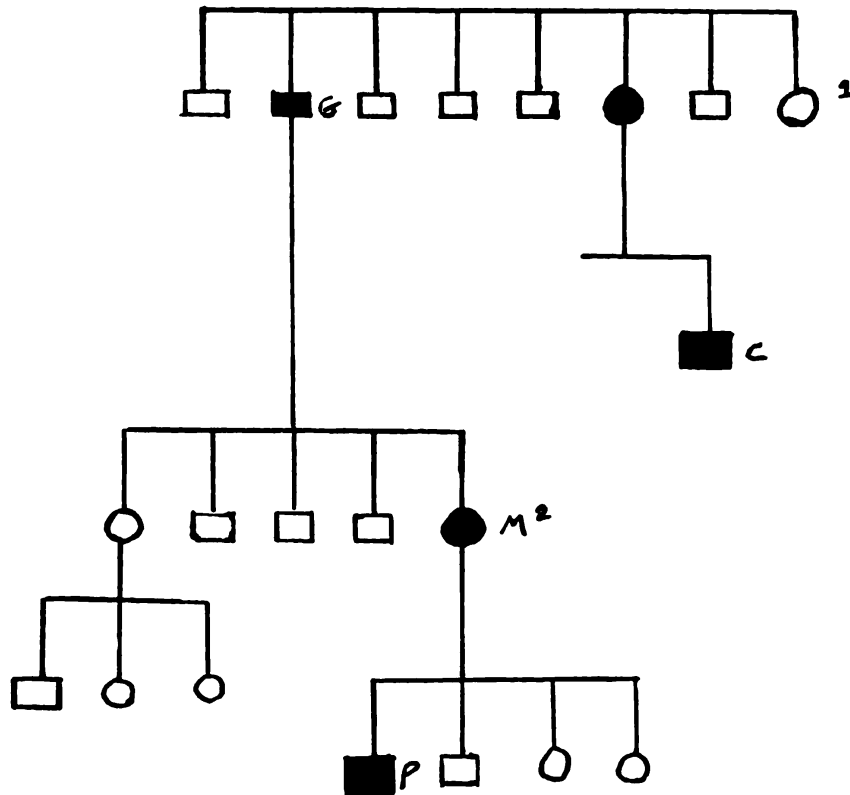
CASE REPORT

J. P. F., a 20-year-old white male, was admitted to the U. S. Naval Hospital, Chelsea, Mass., from the U. S. S. *Fargo* with a diagnosis of "Diagnosis, Undetermined (Blood Dyscrasia)," because of a long history of tendency to abnormal bleeding. The last episode, which prompted transfer to the hospital, followed a ¼-inch laceration of the fourth toe of the right foot which bled for 12 days. During this period a large hematoma of the foot formed and cellulitis and septicemia ensued. The infection responded to penicillin, but hematomata appeared at the sites of injection on both arms and legs. Bleeding time was recorded as 8 minutes, clotting time, 12½ minutes, and the platelet count, 360,000.

Past history.—Patient always had bruised easily but his earliest recollection of real difficulty was of frequent nosebleeds at the age of 12. He denies hospitalization prior to enlistment in May 1946. First hospitalization was on 10 August 1946 for 13 days because of a sprained left ankle. On 11 September an ingrowing toenail was operated upon; post-operative bleeding continued for 3 weeks and the patient was hospitalized 60 days. All blood studies then were reported to be within normal limits. Repeated clotting time determinations were recorded as ranging between 2 and 8 minutes. On 27 December 1946 he was admitted for a large hematoma of the right thigh, which appeared after a fall. He was discharged after 102 days in the hospital with a diagnosis of neuritis, femoral nerve. On 1 July 1947 he was in the hospital for 2 days with a diagnosis of hematoma, larynx. This occurred after a slight blow on the neck sustained in a friendly tussle. The patient states he had so much difficulty in breathing that tracheotomy was at first considered. On 23 December 1947 he reenlisted after having been found physically qualified for duty. The following defects were noted: (a) right thigh smaller than left; and (b) parasthesia over medial aspect, right knee.

On 21 February 1948 a tooth was extracted and bleeding continued for 1 week; cellulitis of the face also occurred. The dental officer made a note in the health record warning of the patient's bleeding tendency. During his last cruise the ship's medical officer noted that the patient, who is a Hospital Corps man, bruised after trivial injury and for this reason had decided to transfer him to a hospital.

Family history.—The patient is of Irish ancestry. His maternal grandfather was a known bleeder although he lived to the age of 89. A maternal cousin died of hemorrhage on the operating table; surgery was of an emergency nature and the patient was unable to inform the surgeon of his abnormal bleeding tendency. It can be seen from the diagram (fig. 1) that this history follows the mendelian law of sex linkage.



- G Maternal grandfather, a known bleeder.
- C Maternal cousin who died of hemorrhage.
- M Mother of patient.
- P Patient.
- Female carrier.
- Presumably normal male.
- Presumably normal female.

Figure 1.—Maternal family tree of hemophiliac patient.

On admission the patient complained of abdominal pain and swelling and pain in both arms and thighs.

Physical examination revealed a tall, well-developed white male appearing somewhat pale but not acutely or chronically ill. There was evident atrophy of the right quadriceps muscle. The right thigh measured 34 cm. just above the condyles, the left thigh, 37 cm. There was a crusted scar on the fourth right toe. Ecchymoses were present on the left anterior chest wall and on both arms and forearms. On palpation of the right gastrocnemius many small areas of what seemed to be calcium deposits and fibrosis were noted. The

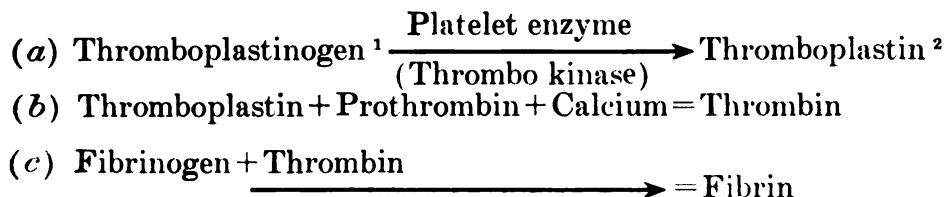
anterior surfaces of both tibiae showed many areas of ecchymoses, the sites (according to the patient) of contusions not severe enough to cause pain at the time of injury. There was diffuse abdominal tenderness and suggestion of a mass in the right lower quadrant, but this and all abdominal symptoms disappeared after 2 days' hospitalization. The liver and spleen were not palpable. The white blood cell count was 13,000 with 83 percent polymorphonuclears. The red blood cell count was 4,650,000; hemoglobin, 14 gm. Blood smear showed no abnormal cells. The bleeding time was 4 minutes and 35 seconds; clotting time, 6 minutes and 15 seconds. Clot retraction was normal. Clotting time was repeated on 3 occasions and reported 4 minutes, 30 seconds; 6 minutes; and 7 minutes respectively. Platelets on repeated examinations were adequate in number. Prothrombin time was recorded as 22 seconds or 34 percent of normal on admission but was 14 seconds or 85 percent of normal, and 13 seconds or 95 percent of normal on subsequent tests. The reticulocyte count was 0.9 percent. Stool examination was positive for occult blood. The tourniquet test was negative. After 2 weeks' hospitalization all the patient's symptoms disappeared, although from time to time he showed evidence of subcutaneous hemorrhages without history of trauma.

An impasse appeared to have been reached in making a diagnosis until investigation of the laboratory procedure revealed that all clotting-time determinations had been made on capillary blood. Coagulation-time determinations of venous blood according to the Lee-White method were then made. According to the patient this was the first time venous blood had been used for this test.

Abnormal prolongation to 50 minutes with a normal control of 16 minutes was demonstrated. Clotting time of capillary blood by the method of Sabrazes on the same day was 3 minutes, 45 seconds. Repeated tests on subsequent days gave values by the Lee-White method of 38 and 35 minutes, normal controls being 13 and 18 minutes. The diagnosis of hemophilia was therefore considered to have been established.

DISCUSSION

Extensive laboratory and clinical investigation by a number of workers in the field, particularly Quick, Minot, Wright, Petek, and Owren has resulted in modification of the classic theory of blood coagulation and the concept of the defect in hemophilia. There is much confusion in terminology, but the mechanism postulated by Quick (2) seems the most attractive and will therefore be outlined and the probable synonyms used by other investigators will be indicated. According to this new concept the stages in the coagulation of blood may be represented by the following formulae:



¹ Probably synonymous with the antihemophilic factor of Minot and Taylor, thrombokinin of Lenggenhager, the antihemophilic globulin of the Cohn fraction, and the prothrombinase or Factor V of Owren.

² Pro-thrombinase or Factor VI of Owren.

In the first step, thromboplastinogen, a constituent of normal plasma, is activated by platelet enzyme to form thromboplastin. It is this factor, thromboplastinogen, which is deficient in hemophilia rather than the platelets (Howell's theory). The activated thromboplastin then reacts quantitatively with prothrombin and calcium to form thrombin. In the hemophiliac, even when coagulation finally does occur in the test tube, only a small amount of thrombin is formed but since it acts as an enzyme this is sufficient to convert all the fibrinogen to fibrin. In vivo, however, the amount of the thrombin formed is for some reason insufficient for normal clotting. The suggestion is made that such a small amount may be inactivated by a small concentration of heparin normally present. Moreover, Quick points out that a normal coagulation time does not exclude the diagnosis of hemophilia. Such a patient may at times produce enough thrombin to effect a normal coagulation time, yet not enough to control bleeding effectively in the body; this he has been able to determine by demonstrating failure of prothrombin consumption during clotting of blood.

The classic criteria for the diagnosis of hemophilia according to Wright et al. (1) include: (a) Familial history for symptoms of hemophilia; (b) personal history of difficulty in controlling hemorrhage; and (c) demonstration of prolonged clotting time of venous blood. These requirements have been fulfilled in establishing the diagnosis in the case reported. Quick states, however, that a history of bleeding and demonstration of poor prothrombin consumption appears to be more reliable evidence on which to base a diagnosis. To the writer's knowledge the technique of this test has not yet been made available for publication.

CLOTTING TIME DETERMINATIONS

In view of the fact that this patient's condition was unrecognized in spite of repeated hemorrhages over a period of 3 years, during which time he was hospitalized repeatedly at two medical centers (at one time being subjected to an elective operation); a critical review of the techniques and limitations of the coagulation time determination seems indicated. From the records it appears that the identical error in performing this test recurred and prevented establishment of the diagnosis.

Quick states, "The determination of the coagulation time of the blood is among the most empirical procedures routinely employed in the clinical laboratory and is one most prone to be misinterpreted. In a critical evaluation of this test one must consider first the mechanism of the procedure and record the physiologic aspects which require a translation of an in vitro observation into a probable in vivo behavior that is coordinated with other factors bringing about hemostasis."

That a normal coagulation time does not eliminate a diagnosis of hemophilia has already been stated. Whatever the technique used in determining the coagulation time trustworthy results can only be obtained by performing the test under rigidly controlled conditions and by excluding outside agents that influence the coagulation reaction. Of the latter, tissue juice, according to Quick, is by far the most important since it contains activated thromboplastin. Obviously blood obtained by skin puncture is unsuitable since it contains an undetermined and variable amount of tissue juice. Since the tissue juice is presumably normal this would explain why the bleeding time is normal in hemophilia. Haden (4) states that doing coagulation time on capillary blood is a waste of time. Quick and Wintrobe (2) (5) say much the same. This would appear to be an understatement of the case since the reporting of such a test gives only a false sense of security to the surgeon, reminiscent of the unfortunate occurrences in surgery of liver disease before Quick demonstrated the prothrombin deficiency in these cases. Still a report of a method of determining coagulation time on capillary blood finds its way into the literature by Kruse and Moses (7) as late as 1945. Their description of the new technique in no way obviates this objection. Moreover, they report no determinations on hemophiliacs. The Sabrazes method utilizing tubes filled with capillary blood is still apparently widely used and is a standard procedure in the naval laboratory manual. The writer knows of two civilian institutions in which this technique is required standard procedure prior to tonsillectomy. The ironic comment has often been made that the patients who bleed excessively have the shortest clotting time. Obviously there are other causes of hemorrhages following operation but it seems not unlikely that some of the unexplained deaths could have been due to hemophilia, masked by a normal capillary clotting time.

In the United States the Lee-White test is gradually replacing other methods. Unfortunately the procedure has not been rigidly standardized for the important variables, such as; temperature, size of tube, and nature of surface of tube.

Quick suggests the following procedure: With a dry syringe, blood is drawn by veno-puncture, with the least possible trauma, using a 22-gage needle; 1 cc. blood is transferred into each of 2 scrupulously clean test tubes 100 mm. \times 13 mm. and placed in a water bath at 37° C. The tube is tilted gently every 30 seconds and the end point taken when a flow of blood is no longer observed. The normal range is 5 to 10 minutes by this method.

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The Neuropsychiatric Patient

Estimation of His Usefulness for Further Service in World War II: Value of an Objective Rating Scale

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THE mission of the Medical Department is "to keep as many men at as many guns as many days as possible." During World War II the neuropsychiatrist helped carry out this mission by: (a) Weeding out the neuropsychiatrically unfit prior to, or during training; (b) by advising combatant unit officers in matters pertaining to prevention of neuropsychiatric break-down and lowering of group morale; (c) by placing those disabled with neuropsychiatric conditions under treatment; (d) by evaluating the usefulness for further service of those convalescing from these conditions; and (e) by recommending for discharge from the service those permanently unfit for further duty. The last two functions, (d) and (e), will be discussed in this report.

The evaluation of the suitability of a patient for further service after a neuropsychiatric illness, or service stress reaction, was one of the medical officer's most difficult tasks. When manpower is limited and the military task difficult and imperative, the job of rating and reclassifying recovered neuropsychiatric casualties can be likened to that of the baseball player who must select the best among a collection of bats, all of which are split in varying degrees. It was to be expected that there would be a considerable variation in the methods of rating and reclassification in different operational areas and at different times as military necessity and manpower resources available changed. There was an additional variable, however, and this involved the attitudes of individual medical officers toward returning a particular neuropsychiatric patient to duty. They varied in a manner that often had little relation to military necessity, or to the patient's ability to perform service, and were highly subjective, unpredictable, and sometimes, capricious.

RATING SCALE OF SUITABILITY FOR FURTHER SERVICE

Boards of Medical Survey tend to correct the subjective evaluations made by any individual medical officer but such correction involves

delay. When the ward medical officer can accurately anticipate the Board's action, he can prepare the patient for that decision and thereby shorten the hospitalization needed. As a guide for anticipating the recommendations of Boards of Medical Survey and as a corrective to subjective appraisals made by neuropsychiatric ward medical officers, the following procedure was carried out at Sampson Naval Hospital in late 1944. The four factors believed most relevant to a prognosis, (a) Preservice Stability, (b) Service Stress, (c) Symptom Severity, and (d) Duration of Symptoms Under Treatment, were graded in a scale of 0 to 4 and each grade defined. The product of Stability \times Stress divided by Symptom Severity \times Duration under treatment, constituted a numerical quotient for a Rating Scale of Suitability for Further Service. This quotient will hereafter be referred to as "Service Suitability Quotient," or S. S. Q.

The calculating of Service Suitability Quotients was carried on for a month and then the quotients were correlated with the recommendation of the Board of Medical Survey. The three neuropsychiatrists of the hospital quickly reached agreement in the quotients for the same patient but were still differing in the type of reclassification recommended to the Board of Medical Survey. In practice it was learned that where the Service Suitability Quotient was greater than 1.2, return to full duty was recommended by the Board. Where the Quotient was between 0.9 and 1.2, limited duty ashore was recommended. Where the Quotient was below 0.9, discharge was advised. In 100 consecutive cases the only exceptions that could be fitted into these limits were (a) the patient's morale was given recognition by adding 0.1 to the Quotient when the man desired return to duty, and 0.1 subtracted when the man asked that he not be returned to duty, (b) 0.2 was subtracted for each prior removal from combat due to neuropsychiatric symptoms, severe illness, wounds, or capture, and (c) men threatening to their unit's morale (epileptics, homosexuals, suicidal patients, somnambulists, or those known to have fired on members of their unit) were discharged.

As further experience was gained with this Service Suitability Quotient, the neuropsychiatrists checked their recommendations against the Quotients and when their subjective evaluation differed sharply from the findings above, explanations were sought. It was soon evident that personal factors; dislike, sympathy, pressure of relatives and other partisans, or the wish to be more "successful" in rehabilitation had clouded objectivity. An objective rating scale made difficult decisions easier and added to the medical officer's morale as it protected him from exposing subjective biases and from experiencing the rebuffs of Board rejections of his recommendations.

FACTOR GRADING DEFINITIONS

(a) Preservice Stability:

- 0=Had mental symptoms requiring hospital treatment in civil life.
- 1=Neuropsychiatric disability preventing success in school, work, sports, and social groups, and still present at induction.
- 2=Neuropsychiatric disability relieved prior to induction and never preventing fair success in school, work, sports, and social groups.
- 3=Average success in school, work, sports, and social groups, without known neuropsychiatric disability.
- 4=Superior character traits of leadership in school, work, sports, and social groups.

(b) Service Stress:

- 0=Broke down upon arrival at training station.
- 1=Broke down during training in United States.
- 2=Broke down overseas before combat.
- 3=Broke down in combat, or on submarine, or flight duty.
- 4=Broke down when wounded, seriously ill, extremely exhausted, or unit rendered leaderless or smashed.

(c) Symptom Severity:

- 0=Fatigue or anxiety symptoms shared by majority of unit.
- 1=Anxiety symptoms more severe than majority of unit but efficient performance of duty continues. Startle reaction, combat dreams, moodiness.
- 2=Symptoms of anxiety interfere with normal performance of duty but can perform some duties. Tremors, anorexia, weakness, insomnia, headache.
- 3=Useless to combat unit but can care for himself. Dyspnea, vomiting, diarrhea, tachycardia, crying, forgetfulness.
- 4=Dangerous to himself or others or requiring others to care for him. Delirium, stupor, severe panic, paralysis, faintness, suicidal, delusions, hallucinations.

(d) Duration of Symptoms:

- 0=Recovered in 24 hours with removal from stress.
- 1=Recovered within 1 week.
- 2=Recovered within 60 days outside United States.
- 3=Recovered within 60 days of hospital treatment in United States.
- 4=Not recovered after 60 days of hospital treatment in United States.

CASE REPORTS

Two illustrative cases demonstrate the application of these factor ratings to determine the Service Suitability Quotient:

Case 1.—J. S., a 22-year-old sergeant in the Marine Corps, had had 4 years of active duty when he was admitted to the sick list at U. S. Army Hospital No. 148 on a Southwest Pacific island on 14 September 1944. His admission complaints were: chills, vomiting, fever, weight loss, tremors, and nightmares. Prior to entrance into the service he had stopped school at 15 when a teacher hit him for arguing, but he was able to make a good occupational, social, and marital adjustment, and he was active in sports. He developed nightmares and startle reaction during combat on Tarawa but remained on duty until he fainted in a severe malaria attack on 5 December 1943. He returned to duty and partici-

pated in severe combat on Saipan and Tinian where he received shell fragment wounds. He was returned to duty in 18 days but 5 days later lost control of himself on night guard duty and shot wildly at shadows with his machine gun. He had a return of high fever and marked nervousness but after 15 days he again returned to duty, only to have a relapse 10 days later with weakness, insomnia, severe nightmares, vomiting, and shaking. While under observation and treatment from 21 October 1944 to 2 January 1945 he was evacuated to the continental United States but symptoms persisted and were greatly aggravated by any discussion of return to duty.

His Preservice Stability was rated average, 3; Service Stress was extreme, 4; Symptom Severity required that others care for him, 4; and Duration of Symptoms extended beyond 60 days in a hospital in the continental United States.

4. The Service Suitability Quotient was $\frac{3 \times 4}{4 \times 4} = 0.75, -0.5$ (twice hospitalized for neuropsychiatric symptoms, $0.2 \times 2 + 0.1$ (fears duty) $= 0.25$). The Board of Medical Survey found him permanently unfit for service with a diagnosis of War Neurosis.

Case 2.—S. E., a 22-year-old SOM 3/c, had had 3 years of active service prior to admission to the sick list on 8 February 1945. Admission complaints were: insomnia and inability to concentrate. He was well adjusted prior to service and was aware of no serious symptoms before combat in Kula Gulf aboard a destroyer, when he noted irritability and inability to think clearly. He was also concerned about his mother who had diabetes and was seriously ill. He was granted leave and ordered to Sound School, but he failed there because he was tone deaf. He was sent to Storekeepers' School where he feared he would fail again. He brooded over combat experiences, loss of appetite, startle reactions, sweats, tremors, and restlessness all of which he had expected to clear up on leaving combat. While under treatment he complained of dizziness and confusion under stress but he steadily and slowly improved.

His Preservice Stability was average, 3; Service Stress was active combat, 3; Symptoms impaired efficiency, 2; and Duration of Symptoms extended beyond 60 days in a continental hospital, 4. Thus, the Service Suitability Quotient is $\frac{3 \times 3}{2 \times 4} = 1.12 - 0.1$ (fears sea duty) $= 1.02$. The Board of Medical Survey recommended limited duty ashore.

DISCUSSION

The Board of Medical Survey expressed a group opinion of the best compromise between manpower needs and the quality of service usefulness the Board believed to be present in the convalescent neuropsychiatric patients seen at Sampson Naval Hospital in late 1944. The numerical quotients expressed the medical officers' estimate of the patient's dependability under stress and could be consistently correlated with the three reclassification categories, Full Duty, Limited Duty, and Unfit for Duty, embodied in Board recommendations. When this Board, in January 1945, recommended that a man with a Quotient of 1.0 be returned to limited duty, other operational situations of necessity would alter that recommendation. If manpower was extremely short, such a man might well be returned to full duty. If military needs were less urgent and manpower abundant, the same

man would be discharged. The use of the Rating Scale for determining a Service Suitability Quotient gave nearly perfect assurance that the ward neuropsychiatrist's recommendation would be acceptable to the Board. The Board's action in turn was objectively more consistent and Bureau approval became nearly invariable. It became possible for the ward neuropsychiatrist and the patient to make earlier plans in anticipation of the Board's action. Consistency and objectivity made it easier for patients to accept and cooperate willingly in the Board's decision, as they saw personal bias and unpredictable caprice were not in evidence.

Tracing the subsequent service efficiency of those neuropsychiatric patients returned to duty would be a valuable contribution to our planning to meet manpower needs in time of war. If the Service Suitability Quotients were known for those sent to limited or full duty, one could hope to establish useful facts. It might become apparent that of 100 men with Quotients of 1.0, 80 percent performed satisfactorily when assigned to limited duty ashore and only 10 percent performed satisfactorily when returned to combat. If of those with Quotients of 1.3, about 90 percent performed satisfactory service on being returned to full duty, it would be evident that it would be a waste to keep him on limited duty; or to send a man rated 1.0 to full duty would be inefficient use of manpower, as the man would almost surely fail.

CONCLUSIONS

Consideration of Preservice Stability, Service Stress, Nature of Neuropsychiatric Symptom Reaction, and Duration of Disability Under Treatment give a basis for estimating the future usefulness in the service of the neuropsychiatric patient. A rating scale is outlined whereby these four factors can be expressed numerically as a Service Suitability Quotient. This Quotient was correlated with the recommendations of the Board of Medical Survey at Sampson Naval Hospital in late 1944 and early 1945 and found to have a high degree of predictable agreement. This method is more objective, consistent, and reliable than the subjective method of assessing service suitability. Such a Quotient could well serve as a starting point for correlating Board recommendations of return to duty and subsequent service usefulness of rehabilitated neuropsychiatric patients should personnel shortage again require us to place manpower of marginal stability under stress.

Pemphigus Vulgaris

Report of a Case Treated With Carbarsone

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PEMPHIGUS is an acute or chronic bullous eruption which appears on normal skin and is accompanied by varying degrees of constitutional symptoms. It can be separated into three distinct types: pemphigus vulgaris (the most common type); pemphigus foliaceus; and pemphigus vegetans. Pemphigus vulgaris is characterized by outbreaks of a few weeks to several months duration with alternating periods of complete or comparative quiescence. This eruption must be differentiated from certain types of erythema multiforme and dermatitis herpetiformis.

Little (1), believing arsenic was the only drug that withstood the test of time in pemphigus vulgaris, suggested in 1945 the use of carbarsone because of its low toxicity, capability of oral administration over a long period of time, high therapeutic efficacy, and its relatively low cost.

CASE REPORT

The patient, a 59-year-old male, was in good health until 6 weeks before admission, when he sustained a laceration on a rusty bed spring. He experienced a week of generalized malaise, weakness, coryza, and easy fatigability. Two days after this prodromata, he had vague chilly sensations but no frank chills, followed by the appearance of localized patches of bullae on his neck and arms. The bullae were on normal skin and were not pruritic. The eruption spread in a patchy fashion during the next 5 weeks and involved the entire body except the mucous membranes. Progression of the eruption was usually preceded by sensations of chilliness. Itching of the older lesions was noted during the past 3 weeks.

In 1941 the patient had had a Miles' resection for an adenocarcinoma of the rectum. He consumes at least four-fifths of a quart of whisky a day. He believes that he eats a balanced diet although he has to avoid certain foods because of their cathartic effect. A blood Kahn test in 1941 was negative.

On admission to the U. S. Naval Hospital, Philadelphia, Pa., on 20 September 1948, the patient was conscious, cooperative, very apprehensive, and slightly dyspneic but not cyanotic.

On physical examination the temperature was 102.6° F.; pulse, 94 and regular; and respirations, 27. The patient had patches of tense, ruptured, and crusted

bullae concentrated on the neck, extremities, and inguinal area (fig. 1). The more recent bullae were on normal skin and those that were healing were on an erythematous base. No lesions were noted on the mucous membranes. The skin showed no excoriations. Nikolsky's sign, icterus, or spider angiomas of skin, were absent.

There were a few coarse râles at the base of the right lung. The patient's heart was found slightly enlarged to the left on percussion. A grade one systolic precordial murmur was audible. There was a sinus tachycardia of 94; the aortic second sound was louder than the pulmonic second sound; and the blood pressure was 140/85. The liver was firm, nonnodular, and was palpated three finger breadths below the right costal margin; a colostomy stoma was in the left lower quadrant; physical signs for ascites were absent; he had slight ankle edema and no varicosities of the lower extremities; bilateral forceful and equal peripheral arterial pulsations were palpable; and the neurological examination was negative.

The laboratory report showed: hemoglobin, 13 gm.; white blood cell count, 13,500, with a differential of 78 percent neutrophils, 20 percent lymphocytes, and 2 percent eosinophils; total protein, 6.0, and A/G ratio, 1.8/1; blood Kahn test, 3 plus; serum bilirubin, 0.17 mg. percent; cephalin flocculation test, 2 plus; and thymol turbidity, 82 Klett units. Urinalysis and blood culture were negative. A chest roentgenogram was normal.

Three days after admission the patient developed bullous mouth lesions. Meanwhile, more bullae continued to appear on normal skin. Five days after admission carbarsone was given, 3 cupsful of amigen daily by mouth and daily potassium permanganate baths in 1:15,000 solution. Acriflavine 1:3000 in petrolatum was prescribed for local use. One tablet (250 mg.) of carbarsone was administered daily by mouth one-half hour before breakfast for 3 days,

followed by 3 days' rest from the drug, then 2 tablets daily for 3 days followed by 3 days' rest, and finally 3 tablets daily followed by another 3 days' rest. He was then given a maintenance dose of 1 tablet daily. Urinalyses and white blood counts with differentials were done. The patient was instructed to call the attention of the attending physician to any localized edema, diarrhea, nausea, vomiting, abdominal pain, complicating skin changes, or any visual symptoms. Three days after the initiation of therapy, he showed 3 plus bilateral ankle edema, bilateral basal râles, a sinus tachycardia of 128 with frequent ventricular extrasystoles. The white blood count at this time was 8,300 with a differential count of 13 percent eosinophils and a slight shift to the left; the urinalysis was negative. Electrocardiographic examination was deferred because of the extensive skin involvement and the toxic condition of the patient.

The patient was believed to have a toxic myocarditis, the result of either the disease or the arsenical therapy, or a combination of both. The drug therapy



Figure 1.—Appearance of patient at admission.

was discontinued for the scheduled 3 days. Large doses of ammonium chloride by mouth, Theophylline Salyrgan intramuscularly, and a high protein, low salt diet were prescribed. A favorable diuretic response occurred and the ankle edema and tachycardia diminished. The eruption, however, continued to appear in uninvolved areas as well as in the healing areas. The patient developed a dry hacking nonproductive cough and hoarseness. Ulcerative lesions were seen on the vocal cords on laryngoscopic examination. In view of the progression of the lesions and the patient's relative systemic improvement after the 3 days of abstinence from the drug; he was given 2 tablets of carbarsone daily for 3 days. The total protein was, at this time, 5.9 gm. per 100 cc. blood, with an A/G ratio of 1.1/1. The patient began to have recurrent episodes of diarrhea which continued after the second scheduled 3-day rest period. The patient explained that this was caused by the cathartic effect of the fruit in his special diet. Three tablets of carbarsone daily was begun; the diarrhea ceased when certain fruits in the diet were discontinued. In view of the Kussmaul respirations, strongly acid urine, and the recent diarrhea, a carbon dioxide combining power was done and was found to be 34 volumes percent; the urine contained no acetone or diacetic acid. A routine white blood cell count at this time was 12,500 with a differential of 42 percent neutrophils, 26 percent bands, 7 percent juveniles, 11 percent promyelocytes, 2 percent lymphocytes, 4 percent prolymphocytes, and 5 percent plasma cells. Bone marrow aspiration showed an extreme nonspecific hyperplasia of all cellular elements. The plasma cell count was approximately 0.6 percent (3 cells).

After 17 days of hospitalization, no new lesions were noted. Most of the healing lesions were composed of small violaceous papules arranged in annular configuration with central clearing. Histological study of these lesions revealed a subacute nonspecific dermatitis; histological study of a more recent intact bullous lesion was reported as consistent with pemphigus vulgaris. The patient's appetite improved when the ammonium chloride and amigen were discontinued.

A gastro-intestinal series done 3 weeks after admission showed minimal irregularity of the lumen with widening of the valvulae conniventes of the jejunum suggestive of edema or hypoproteinemia. An electrocardiogram at this time showed a left axis deviation with a normal sinus rhythm. The previous necrotic slough areas of the cords were shown to be healed without scarring on repeated laryngoscopic examination. Four weeks after admission the white blood cell count was 6,900 with 77 neutrophils, 18 percent lymphocytes, 3 percent monocytes, and 2 percent eosinophils; urinalysis was negative; total protein was 7.2 gm. per 100 cc. blood with an A/G ratio of 2.1/1; and the Kahn test was negative. The patient was afebrile, ambulatory, asymptomatic, and free of any new lesions. The few remaining lesions were almost completely healed; there was no residual scarring but there was some residual pigmentation in scattered healed lesions.

A week later the patient was discharged on a maintenance dose of one tablet of carbarsone daily.

COMMENT

There was a rapid and favorable response of the disease to carbarsone as well as a remarkable tolerance to the drug in spite of the existing Laennec's cirrhosis and colostomy.

The appearance of the annular lichenoid eruption raised the possibility of an arsenical eruption or a bullous lichen planus. The pos-

sible drug eruption was ruled out by the disappearance of the eruption while the patient was still taking carbarsone. Crocker (2) described a generalized bullous eruption in a patient who was not receiving arsenic. The possibility of bullous-type lichen planus was dismissed and pemphigus vulgaris was confirmed by histological study of skin biopsies.

The maintenance of electrolytic as well as protein balance was attempted through diet and amigen by mouth. The episode of diarrhea, exudate from the bullae, and the cirrhosis of the liver created much anxiety about the maintenance of chemical balance; however, no clinical state developed that necessitated the parenteral administration of chemical or protein solutions.

The peculiar blood response was believed to be reactive rather than neoplastic and probably was the result of infection which many feel is the cause of pemphigus. Others believe that a virus is the responsible agent. Grace (3) studied the blood picture in pemphigus vulgaris and stated that with the use of a bacteriostatic agent the proportion of immature polymorphonucleocytes in the blood stream is the most sensitive index of the general condition of the patient. Unfortunately our patient was not on a bacteriostatic agent and if his bizarre blood response was used only as an index of his general condition he should have presented a much more critical clinical picture. None of Grace's 11 cases showed as much leukocytic immaturity in spite of the fact that 10 of his cases died and all the studies were done in the terminal stages of the disease. Wintrobe (4), discussing the complications of organic arsenical therapy, mentions thrombocytopenia, granulocytopenia, hemolytic anemia, and anemia, but no "primary" immature leukocytic response. He attributes the above dyscrasias to idiosyncrasy.

The myocarditis was believed to be a toxic manifestation of the disease and not of carbarsone. The healing of the myocarditis in spite of the continuation of the drug seems to support this opinion. The biological false blood Kahn test was also interesting.

Combes (5) believes that patients treated with carbarsone are not cured but arrested, have quicker remissions, and enjoy longer periods between recurrences. Costello (5) states that the administration of carbarsone supplemented with amigen, although it is not ideal, is the most effective and least harmful treatment for pemphigus vulgaris.

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Herpes Zoster

Fasting¹ recommends sponging with carbon tetrachloride on cotton for the relief of painful areas in herpes zoster. He assumes that the relief of pain occurs as a direct action of carbon tetrachloride on the peripheral nerve endings. Although protracted inhalation of carbon tetrachloride fumes is toxic, no case of carbon tetrachloride poisoning from dermal penetration has been reported.

¹ FASTING, G. F.: Herpe's zoster therapy, pain relief by simple procedure. New Orleans M. & S. J. 101: 378, Feb. 1949.



Congenital Torsion of the Penis Associated with Balanic Hypospadias

Report of a Case

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HYPOSPADIUS, a congenital arrested developmental malformation, is said to occur about once in every 350 males. Seventy-five percent or more are of the glandular type. Ordinarily the hypospadiac is not inconvenienced; he is fertile and operative correction is a selective procedure.

Circumcision is ill advised unless and until plastic surgical repair is considered and rejected, because the dorsal hood is valuable graft tissue.

Of four modern urological texts consulted, only one mentions torsion of the penis, to say that it is "often" associated with epi- or hypospadias. This obstruction is not borne out in the writer's experience, nor that of his associates in the examinations of many thousands of males.

This unusual case of congenital torsion of the penis is assumed to be caused by an irregularity of fusion of the margins of the urethral folds during embryonic growth.

A premature healthy male infant was seen in consultation following circumcision on the eighth day of age. The ventral penile surface presented anteriorly; the scrotal raphe circled the proximal penis to the left. The shaft remained in this upside down position in both the flaccid and erect states (fig. 1). The penile raphe terminated at a balanic hypospadias. There was no preputial frenum, no penile curvature during erection. Both testes were in the scrotum, and the cremasteric reflexes were normal. The urinary stream arched exaggeratedly; indeed, in the supine position the infant veritably urinated in his own face.

The infant was again seen at the age of 3 months. The circumcision was well healed. The anomalous penile position persisted.



Figure 1.

The Problem of Urethral Discharge

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URETHRAL discharge among naval personnel frequently poses a medical problem. Difficulties relating to exact diagnosis and proper treatment, combined with a considerable number of man-hours lost from duty, are a source of concern for the medical officer.

MATERIAL

This is a study of 127 men who had or were suspected of having a venereal disease. They were seen at the Naval Dispensary, Portsmouth, N. H., during the past 17 months because of: (a) urethral discharge; (b) follow-up of previously treated venereal disease; (c) positive serological test for syphilis; (d) suspicious lesions on genitalia; and (e) named as contact on a venereal disease report. Only those cases seen by the author are included.

The final diagnoses in these 127 individuals were as follows:

(a) Urethral discharge:	
Gonorrhea.....	70
Nonvenereal.....	39
(b) Gonorrhea contact, no symptoms:	
Gonorrhea.....	6
No disease.....	11
(c) Syphilis.....	13
(d) Chancroid.....	1
(e) Granuloma inguinale.....	1
<hr/>	
Total cases.....	141

The men in categories *a* and *b* are discussed in this article.

PROCEDURE

When a man is admitted complaining of urethral discharge, a genito-urinary history is obtained, examination of the external genitalia done, laboratory tests (smear and culture of the urethral discharge) made, and, if necessary, a prostatic examination is done and a smear and culture made of the expressed fluid. A blood Kahn test is always done on the first visit. If the smear is positive for gram-negative intracellular diplococci indicating a routine case of gonorrhea the patient is given 100,000 units of aqueous penicillin intra-

muscularly every 2 hours for 4 doses; a total of 400,000 units. He is placed on the venereal disease restriction list for 15 days. Between injections he returns to his station and continues to work. On the third and tenth days after treatment the patient returns to the dispensary for a check-up to determine if the discharge has stopped. At this time a prostatic massage is done and the secretion studied by means of smear and culture. This serves the dual purpose of examining the prostate and determining whether the patient is harboring gonococci. If, at the end of 10 days, the patient has no symptoms and the smears and cultures are negative, he is removed from the restriction list, but advised to avoid alcohol and sexual intercourse for 5 weeks. He is also advised to have a blood Kahn test every month for 4 months.

If the initial smear fails to reveal gonococci, a culture is obtained of the prostatic fluid and the urethral discharge. This is repeated three or four times, and if the discharge persists, or a culture is positive for *Neisseria gonorrhea*, the patient is transferred to the naval hospital for further treatment. A few of our earlier nonroutine cases received ambulatory treatment at the dispensary, but it was soon found that they did not respond and they were eventually transferred to the hospital. Many cases did not receive any specific treatment; the discharge having stopped while the patient was being investigated; and since smears and cultures were negative, the man was discharged with instructions to return at the first sign of any symptoms.

Smears are stained with gentian violet and basic fuchsin as the counterstain. Cultures are done on chocolate-agar plates, incubated for 48 hours in a candle jar with a moist sponge, then covered with oxidase reagent. The colonies which become pink and then black are stained. If the smear shows gram-negative diplococci, the culture is considered positive. Unfortunately corroborative sugar fermentation tests were not done. The bacterial growth of the negative cultures was not determined, the presence or absence of gonococci alone being indicated. We had a few oxidase positive colonies which were not typical of *N. gonorrhea* and were considered negative.

RESULTS AND DISCUSSION

On the basis of the means of diagnosis, 5 groups of cases are outlined as follows:

1. Gonorrhea :	
a. Smear positive.....	56
b. Smear negative, culture positive.....	14
c. Contact, no symptoms.....	6
2. Nonvenereal.....	39
3. No disease, contact, no symptoms.....	11
Total cases.....	126

These 126 cases are divided among 114 individuals; 12 men having 2 admissions while under observation; 6 men had 2 distinct infections of gonorrhea at intervals of from 15 days to 9 months; 2 men had 2 admissions for nonvenereal infection and 1 man developed gonorrhea 15 days after being studied for a nonvenereal discharge; 3 men were treated for a nonvenereal discharge subsequent to an attack of gonorrhea.

CRITERIA FOR GROUPS

The criteria for group 1, Gonorrhea, is a positive smear or culture. No attempt has been made to present an anatomical location of the inflammation within the genito-urinary tract, but all those in group 1a, Smear positive, are considered urethritis. Many of those in group 1b and probably all those in group 1c are cases of prostatitis. Group 1c, Contact, no symptoms, consists of those men whose wives had gonorrhea. These men were sent to the dispensary for a check. None of them had any symptoms at the time, yet culture of prostatic secretion revealed gonococci. Group 2, Nonvenereal, are those men complaining of urethral discharge, but their smears and cultures were negative for gonococci. This is also known as nonspecific urethritis, but many of the lesions are probably in the prostate rather than the urethra. Group 3, No disease, contact, no symptoms, consists of those men who were exposed to a known case of gonorrhea (wife), had no symptoms, and had repeated negative cultures of prostatic secretion.

PAST HISTORY

Table 1 outlines the venereal disease history of the 114 individuals. The cases of venereal disease which were studied by the author are added to those recorded in the individual's past history.

TABLE 1.—*Venereal infections*

Number infections per individual	Total individuals		Total cases	
	Number	Percent	Number	Percent
0.....	29		0	
1.....	51	60	51	36
2.....	23	27	46	33
3.....	5	6	15	11
4.....	3	4	12	9
5.....	2	2	10	7
6.....	1	1	6	4
Total venereal diseases.....	85	100	140	100

Thirteen percent of the individuals were responsible for 31 percent of the cases of venereal disease. Further study of these cases reveals the following:

(a) Ten men had 2 distinct infections of gonorrhea within 10 months; 7 of them within 5 months. Two had gonorrhea separated by only 15 and 20 days.

(b) One man had 6 cases of gonorrhea within 5 years.

(c) Syphilis occurred in another man $2\frac{1}{2}$ months after an attack of gonorrhea. This man, conceivably, was infected by syphilis and gonorrhea at the same time.

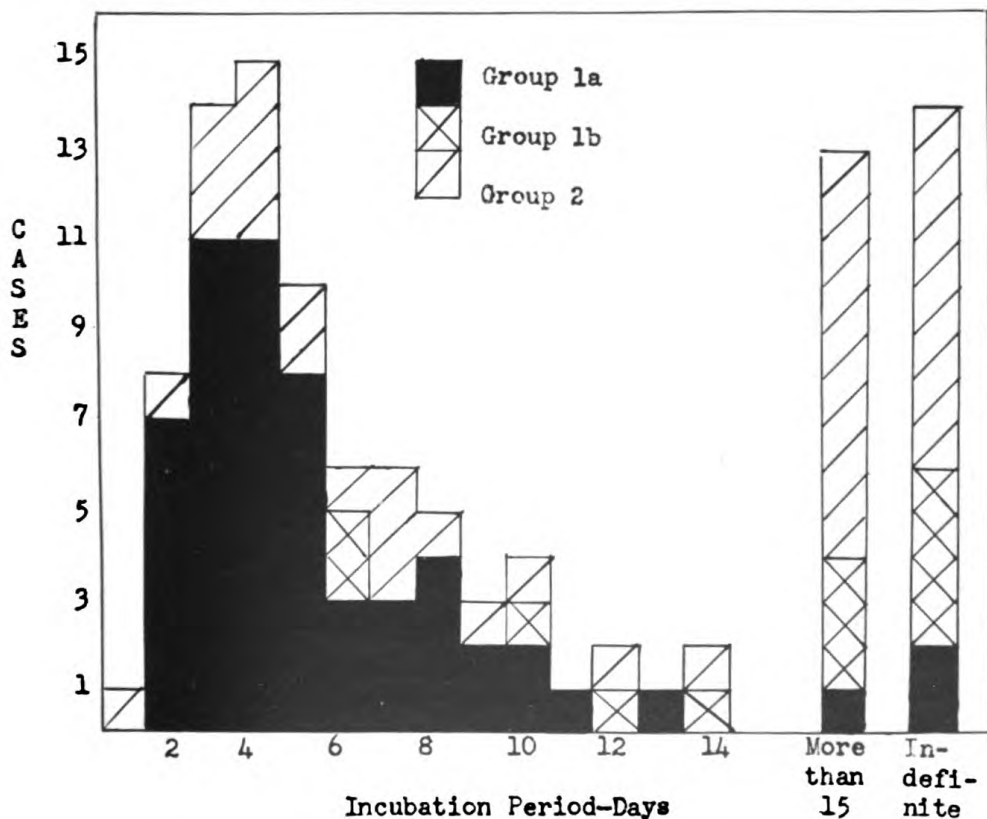
(d) Nonvenereal discharge occurred in 6 less than 1 year after an attack of gonorrhea.

(e) Gonorrhea occurred in 1 man 4 months after he was treated for syphilis.

From this data it is evident that an attack of venereal disease does not in the least discourage a man from exposing himself to a second infection. There appears to be a certain segment of our naval personnel population who are immune to lectures, movies, pamphlets, and talks by the medical officer.

INCUBATION PERIOD

The relation of the incubation period (the number of days between the last sexual exposure and the onset of urethral discharge) is shown



RELATION OF THE INCUBATION PERIOD TO MEANS OF DIAGNOSIS

Figure 1.

in figure 1. It is evident that those in group 1*a*, smear-positive, the routine cases of gonorrhea, have an incubation period of from 2 to 13 days, the average being 5 days, the longest, 28 days.

The 2 cases in which no specific incubation period could be determined are classified as indefinite. When the number of days that the patient has had his urethral discharge before reporting to the medical officer was added to the incubation period, we found that the longest time interval between exposure and a positive smear was 31 days. However, most of the cases were reported within 1 or 2 days after the onset of symptoms. In contrast, if we take the cases in group 1*b* (those with a negative smear but a positive culture), the incubation period appears quite variable. Of these, none had an incubation period of less than 6 days and many were indefinite. The incubation period of those in group 2, nonvenereal, are scattered over the entire chart. Hence, a patient with an incubation period of less than 15 days has a good chance of having a routine case of gonorrhea, easily diagnosed by smear. The longer the incubation period, or if it is not readily determined, the less likely that the patient has gonorrhea, and the more difficult it is to make a diagnosis.

CLINICAL DIAGNOSIS

An analysis of the urethral discharge and associated symptoms reveals information which aids in establishing an exact diagnosis. The routine cases of smear-positive gonorrhea, group 1*a*, have the onset of profuse, continuous, yellow discharge 3 to 4 days after exposure. This is associated with burning on urination. A considerable number stated that burning on urination was their initial symptom; the discharge appeared within 36 hours. Only 1 man did not have associated burning. These patients are able to express creamy yellow exudate from the urinary meatus (which may be edematous and red). Only 6 of the 56 cases used adequate protection during intercourse; 3 used condoms, 2 used a Navy "pro" tube, and 1 used argyrol irrigation.

In comparison, the urethral discharges of those in groups 1*b*, smear negative, culture positive, and 2, nonvenereal, were: scant, usually occurred in the form of a tear in the morning on awakening; white in color; and usually not associated with burning or itching. The scant clear tear is termed "gleet" and is indicative of chronic prostatitis. Many of these men have had an intermittent urethral discharge for 1, 2, and even 3 years. Some state that their discharge appears only after a night of drinking. Examination of the genito-urinary system will reveal a slight white mucoid urethral tear, and frequently no discharge can be demonstrated. In about 50 percent of the cases the prostate shows variable changes including enlargement, bogginess.

or nodularity. We found no exquisitely tender prostates characteristic of acute prostatitis.

Seventeen men were studied because their wives had gonorrhea. None had any symptoms referable to the genito-urinary tract for at least 4 months. Examinations of the external genitalia and prostate were negative, except for slight changes in the prostate in about 50 percent of the cases. Yet 6 (group 1c) had positive cultures of their prostatic secretion. One man in this group had never had any urethral discharge, the other 5 had a past history of gonorrhea or non-specific urethritis. Another had been treated for a routine case of gonorrhea 4 months previously. He had a negative culture on his tenth post-treatment day, at which time the discharge had stopped. He subsequently married and a few weeks later his wife had gonorrhea. A culture of the prostatic fluid revealed gonococci, although the patient was asymptomatic. These men must have had latent prostatitis, with gonococci lying dormant in the prostate, which infects their sexual partner, but does not produce symptoms in the male.

SMEARS AND CULTURES

A smear of the urethral discharge was the means of diagnosis in 56 cases, 75 percent of the cases of gonorrhea. One-quarter of the cases of gonorrhea would have been missed if facilities for culture were not available. Stained slides were examined for 2 purposes: the detection of gram-negative intracellular diplococci; and an estimate of the number of white blood cells. A routine positive smear showed a great number of white blood cells, about 10 percent of them containing gram-negative diplococci. These intracellular cocci can be easily found after less than a minute's search of the slide. All our cases with positive smears also had positive cultures. An estimate of the number of white blood cells, which are graded from 1 to 4 plus, is made in negative smears which gives some indication of the presence of infection. This is of special importance when studying prostatic secretion.

The smears of those in group 1b, smear negative, culture positive, revealed very little. Eight of the 14 cases showed 2 to 4 plus white blood cells, while 4 showed few or no white blood cells. These smears and cultures were of both urethral discharges and prostatic secretions. The gonococcus was isolated by culture in 9 cases from prostatic fluid, in 4 from urethral discharge, and in 1 from both. Four of the 14 cases required more than 1 culture before a positive one was obtained, 2 of these cases had 2 negative cultures before a positive one was obtained.

Smears of the 39 cases of group 2, nonvenereal, followed a set pattern. All but 3 showed 2 to 4 plus white blood cells in smears of

urethral discharge and/or prostatic secretion. Two of the 3 cases which showed few white blood cells were men who had a urethral discharge only by manipulation. All of the men in this group had more than 1 culture before the presence of gonococci was ruled out.

The smears of those in groups 1c and 3, the asymptomatic contacts, were of prostatic fluid. All were normal showing no evidence of active or latent infection. Yet 6 of the 17 men had positive cultures. Four of the six cases required more than 1 culture before getting a positive one; 1 man required 4 cultures.

Thus, of a total of 109 men who had urethral discharge, 70 were found to have gonorrhea; 14 of whom required a culture in order to find gonococci. The smear thus provides a convenient, quick, and simple means of diagnosing the routine case of gonorrhea. If the gonococcus is not readily identified by slide, it then becomes necessary to do a culture. A smear will often fail to reveal any evidence of infection, and yet a patient may be harboring gonococci. Therefore, before telling a man that he is free of venereal disease; it is necessary to thoroughly study the lower genito-urinary system, including repeated cultures of the urethral discharge or prostatic fluid. Absence of symptoms, a normal prostate both by palpation and by study of its secretion, do not rule out the presence of the gonococcus.

To quote the late P. S. Pelouze (1), "In tracing the source of a given (gonococcal) infection, the most common finding is that it was acquired where one or many physicians had said it did not exist. * * * how much of the gonorrhea in the world today is here because of the sins of omission or commission of our medical profession."

TREATMENT AND RESULTS

Treatment consisted of penicillin in all cases, with the addition of sulfadiazine or sulfathiazole in some. The total number of sick days is computed for each group, only days in the hospital being considered as sick days. Of the 56 cases of group 1a, smear positive, 49 ambulatory patients were successfully treated with 100,000 units of penicillin every 2 hours for 4 doses, a total of 400,000 units. The urethral discharge stopped completely in less than 10 days, usually after the first day. Smears and cultures of prostatic secretion were negative on the tenth day after treatment. Of the remaining 7; 1 was not treated by us, and 1 was a reinfection within 20 days of the initial infection. He was given, as a precautionary measure, 1 million units of penicillin with good results. The remaining 5 were considered treatment failures. A relapse occurred in 1 man 68 days after the original infection. (This man steadfastly denied exposure during this period.) He was successfully retreated with 400,000 units of penicillin. Two were cured from a bacteriologic but not a clinical

standpoint; 1 had a persistent morning urethral discharge for 2 months, the second had persistent urethral discharge and finally developed epididymitis. He was treated with 8 million units of penicillin at the hospital. Both of these men had repeated negative cultures after their original treatment. The other 2 cases had positive cultures after routine treatment and required prolonged retreatment in the hospital. The cultures remained positive even after 13 and 17 days of therapy with penicillin. One of these men had had a urethral discharge for 17 days before reporting to the dispensary for original treatment. This possibly could account for the intractability of the disease.

Of a total of 54 cases treated with 4 doses of penicillin, 49 (90 percent) were cured, 1 had a relapse, 2 were cured from a bacteriologic but not a clinical standpoint, and 2 were failures from a bacteriologic standpoint and required further treatment in the hospital. For the entire group there was an average of 1.2 sick days per case.

In 14 cases of urethral discharge, the diagnosis was made by culture, group 1b. All these men were given various dosages of penicillin, ranging up to 10 million units, plus sulfadiazine or sulfathiazole. They were refractory to treatment in most instances; 4 of the cases had positive cultures for from 7 to 35 days after the onset of daily injections of penicillin. Four other cases were given the routine 400,000 units of penicillin; in 2 of these, because of a persistent urethral discharge and positive cultures, retreatment in the hospital with large doses of penicillin was required. One had a persistent discharge for 30 days after treatment with negative follow-up cultures but was not retreated, and 1 was successfully treated. There were a total of 267 sick days with an average of 19 sick days per case. This is a considerable increase in the number of days required for treatment when compared to the previously discussed group.

Twelve of the 39 cases in group 2, nonvenereal, received therapy. All except 2 were hospitalized and received the same regime as the previous group. Many of these men had been having intermittent urethral discharge for months and even years and were difficult to cure. Unfortunately the author was unable to compare the duration of urethral discharge in the treated and untreated cases. In general, the discharge stopped in from 10 to 30 days regardless of treatment. This group of nonvenereal urethral discharge included the men who were told, without benefit of a culture, that they had a "strain." Men repeatedly state that they had a previously untreated urethral discharge which was caused by heavy lifting. The only strain that the urethra or prostate is subjected to is that associated with sexual intercourse. In this group, there was a total of 129 sick days or an average of 10 sick days per treated case.

The cause of the nonvenereal discharge, which accounted for over one-third of the cases in which urethral discharge was the presenting complaint was difficult to determine. More than one-half of the men had had a previous urethral discharge, either gonococcal or nonvenereal, so that their present discharge could have been caused by a chronic prostatitis or urethritis with recurrence of symptoms following some, as yet undetermined, stimulus. Some noticed that their discharge appeared after heavy drinking and disappeared in a few days, but in most cases no obvious cause was evident. The chief problem was the disposition of these cases. Should they all have received chemotherapy? Our policy was to do repeated smears and cultures, including prostatic secretion. If after 1 week there is no improvement the patient is sent to the hospital for treatment. The factor responsible for apparent cure in the treated cases is problematical. Was it the bed rest, chemotherapy, or abstinence from alcohol and intercourse?

CONCLUSIONS

The Navy is losing man-days and is spending a considerable amount of money for medical care in order to cure these men with chronic urethritis. The complicated, diagnostically difficult cases are largely responsible for this situation, not the run-of-the-mill smear positive case of gonococcus infection of the urethra. It appears that once the gonococcus has gained a foothold, it is difficult to eradicate it. Easy diagnosis—easy treatment. A greater effort should be made to get the men to report any symptoms of urethritis immediately to the medical officer, so that a thorough study, including cultures may be carried out and the patient placed under appropriate therapy. Again Pelouze (1) is quoted “* * * medically outcast, gonorrhea has limped through the years, a veritable nobody’s child. It is a serious disease and needs serious attention.”

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Tumor of the Glomus Jugularis

Report of a Case

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IN 1941 Stacy R. Guild (1), of the Otological Research Laboratory, Johns Hopkins University, reported the discovery of hitherto undescribed structures in the temporal bones. These are small ovoid bodies, 0.5 to 0.25 mm., usually single but sometimes multiple, and usually located in the adventitia of the dome of the jugular bulb immediately below the bony floor of the middle ear and near the ramus tympanicus of the glossopharyngeal nerve. They are sometimes in the canal of the ramus tympanicus.

Microscopically these bodies consist of blood vessels of capillary or precapillary caliber with numerous epitheloid cells between the vessels. The structure is similar to that of the carotid body. Like the carotid body these structures derive their nerve supply from the glossopharyngeal nerve and their blood supply from the ascending pharyngeal artery via its tympanic branch. Guild named this structure the glomus jugularis.

The physiology of this small organ has not, as yet, been worked out, but it has been assumed that the parenchymal cells are chemoreceptive and similar to those in the carotid body.

Little attention was paid to this observation by Guild until January 1945 when Rosenwasser (2) reported a tumor of the middle ear of carotid body structure which he suggested might have developed from the glomus jugularis of Guild. The pathologic diagnosis of this tumor was made by Dr. Sadao Otani. In 1947 LeCompte, Sommers, and Lathrop (3) reported a tumor of carotid body type arising in the middle ear, and shortly thereafter Kipkie (4) reported the simultaneous occurrence of chromaffin tumors of the carotid body and the glomus jugularis. In September 1948 Winship, Klopp, and Jenkins (5) added 2 more cases and summarized the data on 11 proved glomus jugularis tumors and 13 previously reported cases of middle ear tumors diagnosed endotheliomas or hemangioendotheliomas that, on review, were suspected of belonging in this category. According to

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these authors the most common clinical symptoms are: (a) the presence of an aural polyp which, if ulcerated or removed, bleeds profusely and tends to recur; (b) loss of hearing progressing to deafness; (c) chronic otorrhea; (d) facial paralysis; and (f) pain which is a late manifestation and may not be present if the tumor is benign. The life history of the tumor is apparently similar to that of carotid body tumors. Among the reported cases there has been one instance of metastasis to a regional lymph node.

The histogenesis of these tumors, like that of carotid body tumors, is disputed. Some claim the parenchymal cells of the carotid body are derived from neural crest cells, and they include the carotid body with the paraganglia. Others feel that the pericytes of Zimmerman give rise to these epitheloid cells and place the carotid bodies among the glomi. It has been claimed that the chromaffin reaction by the cells of the carotid body is very weak or absent. Since the intensity of this chromaffin reaction is inversely proportional to the time elapsing between excision of the tissue and fixation, there is little basis for these arguments except in instances where the tissue has been placed immediately into a fixative containing chromium salts.

The combination of location and histologic structure of tumors of both the jugular and carotid bodies is sufficiently characteristic to allow a diagnosis on the basis of these two factors alone. In the case of the simultaneous occurrence of tumors of both the jugular and carotid bodies on the same side, there may be difficulty in ruling out a tumor primary in the jugular body with metastasis to a lymph node in the region of the carotid body, or vice versa.

We have recently encountered a tumor involving the middle ear and producing a jugular foramen syndrome. This is reported primarily for its pathologic interest. A more extensive report of the clinical features and follow-up data will be made later by others.

CASE REPORT

Clinical history.—A 24-year-old white female stated that she had had trouble with her right ear for 6 years, with deafness, a feeling of stuffiness, and lancinating pains radiating toward the occiput. For 2 years she had had difficulty in articulation as though she had a thick tongue. For a year and a half there had been some difficulty in swallowing. Two years previously she had been examined for the same complaints; biopsy of a red heaped-up papillomatous formation on the floor of the auditory canal near the drum showed a small fragment of squamous epithelium covering a slender core of loose connective tissue and capillaries.

Physical examination showed atrophy of the right half of the tongue with loss of sensation of the anterior two-thirds on the right; the tongue deviated to the right when protruded. There was a palatal sag on the right; sensation of the palate was normal. There was air conduction deafness in the right ear with lateralization of the Weber to the right. No masses were palpable in the neck.

The vocal cords were not paralyzed. There appeared to be paralysis of the right side of the epiglottis. The right eardrum was red, and on the floor of the auditory canal near the drum there were some nodular formations which appeared papillomatous and red in color. Roentgenogram of the skull showed a defect in the region of the right jugular foramen approximately 2.5 cm. in diameter; the margins were smooth and comparatively dense suggesting a slowly expanding noninvasive lesion in this region.

Operation.—A right radical mastoidectomy was performed. The mastoid cell walls were intact. During the progress of the operation a tumor mass was noted in the middle ear, extending through a dehiscence in the floor of the middle ear. A specimen of this tumor mass, which was red in color, was removed for biopsy; profuse bleeding was encountered. Following operation, the patient noted better control of her tongue and was able to swallow more easily.

Pathologic observations.—Sections of the tissue removed from the floor of the middle ear showed a tumor covered on one surface by ciliated respiratory epithelium. The tumor (fig. 1) is composed of small groups and cords of cells which have an epithelial appearance. The clusters are made of 4 to 10 cells and are separated by delicate fibrous tissue septa, giving the tumor an organoid pattern. The cells are fairly large with a small round or oval nucleus having evenly distributed chromatin. The cytoplasm is abundant and eosinophilic. In many of the cells the cytoplasm is granular, the granules staining red with Masson's stain. In others there are vacuoles. The cells are usually round or oval in outline, but some are irregular. Many thin-walled, dilated blood vessels run through the tumor in close association with the parenchymal cells. No mitotic figures are seen, however, some of the nuclei are fairly large and hyperchromatic.

Diagnosis.—Benign jugular body tumor.

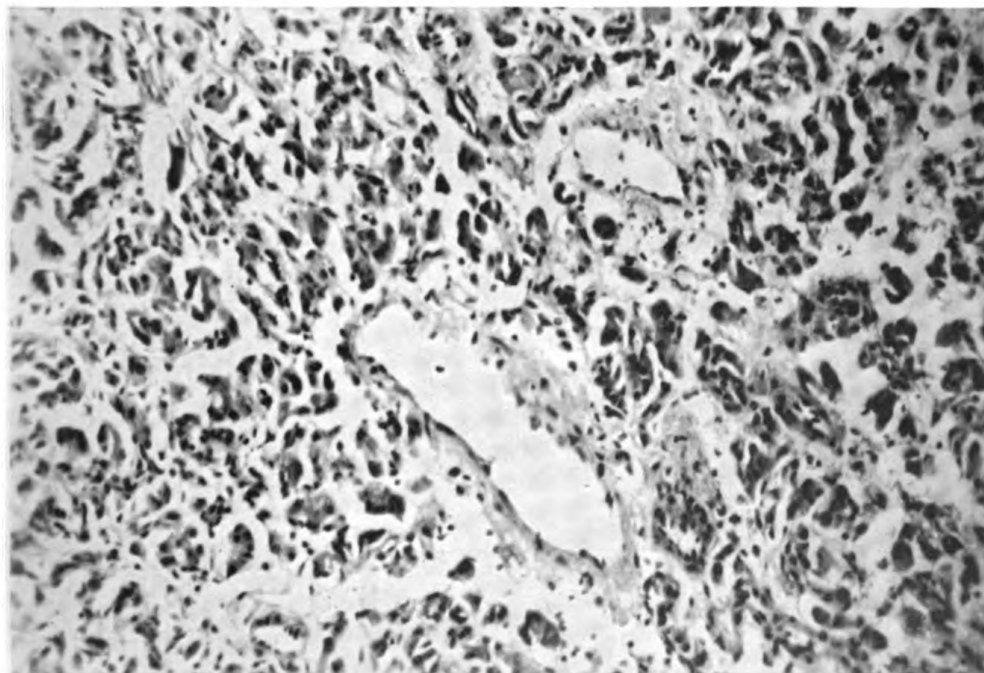


Figure 1.—Photomicrograph of the tumor to show its organoid structure and the association of parenchymal cells with large thin-walled vessels.

COMMENT

It is probable that the first tissue removed for biopsy from the external auditory canal consisted only of the skin overlying the tumor. The microscopic structure plus the long history would indicate that the tumor is benign, and this is substantiated by the appearance of the roentgenogram of the skull. Tumors of this type have previously been reported to be radioresistant (5), so another attempt to remove the tumor surgically is contemplated.

The histologic criteria for the diagnosis of this tumor are now well established, but there is a lack of data on the natural history of the neoplasm and the most effective method of treatment.

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Pheochromocytoma

Report of a Case

KENNETH P. BACHMAN, *Lieutenant (MC) U. S. N.*

RECENT medical literature, with papers by Cahill (1), Burrage and Halstead (2), Bartels and Wall (3), Brunschwig (4), Spalding (5), Espersen and Dahl-Iversen (6), Mencher (7), Calkins and Howard (8), and Guarneri and Evans (9) contains many good descriptions of the signs and symptoms of pheochromocytoma and reports of successful treatment by surgical extirpation of such tumors. MacKeith (10) also reported successful surgical removal of a pheochromocytoma; the case was unusual because the tumor removed was of the rare malignant type.

The increasing number of reports of surgical cures of pheochromocytoma (adrenal chromaffinoma) or paraganglioma (extra-adrenal chromaffinoma) shows the present trend toward earlier as well as more frequent diagnosis of these tumors. Such diagnoses, especially in cases with sustained hypertension (which cases are not rare) have been aided by the introduction of such tests as the histamine test of Roth and Kvale (11), the benzodioxane test of Goldenberg, et al. (12), and the mecholyl test of Guarneri and Evans (9).

The following case illustrates the difficulty in diagnosis of the type of case which presents sustained, rather than paroxysmal hypertension. It also presents certain unusual features which further complicated the problem of diagnosis.

CASE REPORT

A 25-year-old white male was first admitted to the U. S. Naval Hospital, St. Albans, N. Y., on 13 February 1947 with symptoms and signs of malignant hypertension.

He had been essentially well until August 1944, at which time, while flying for the U. S. Army Air Force in the Aleutians and taking benzedrine in order to remain alert, he noted the onset of left visual scotomata associated with suboccipital headaches and stiff neck. At this time he also noted cloudiness of his urine associated with nocturia two or three times.

About February 1945 he first developed spider-shaped areas of blurred central vision in both eyes. His blood pressure which had been recorded as 118/60 about December 1944, 4 months after onset of symptoms, was then (February 1945) 160-185, systolic, according to the patient's statement, the diastolic being unknown to him. Urinary frequency had now increased from an original 4 daily

and 0 nightly to 6 to 10 daily and 2 to 4 nightly. Anorexia and nausea appeared as well as dyspnea on exertion. Casts, albumin, and red cells appeared in the urine and in September 1945 he was discharged from the Army with a diagnosis of "chronic nephritis."

Subsequent to discharge, he did not work because of hypertension associated with intermittent attacks of sharp epigastric pain which radiated into one or both kidney regions and/or between the shoulder blades. The attacks lasted an average of two weeks, subsiding spontaneously. The patient's weight decreased from 157 to 120 pounds.

In December 1946 he entered an Army hospital with his first attack of gross hematuria associated with periorbital and ankle edema. Sympathectomy was considered and the patient was transferred to a New York hospital for possible surgery. At the latter hospital the blood pressure in the right arm was 212/150, in the left arm, 240/156; and in the right leg, 300/160. A grade 4 hypertensive retinopathy was present. Tenderness was noted over both kidneys. Extensive studies for essential hypertension were performed, including tests with etamon and dibenamine; these drugs caused no significant drop in blood pressure.

Pertinent positive findings at the time included: hemoglobin, 9.5 gm. percent; red blood cells, 3.2 million; specific gravity of urine, 1.008 to 1.010; albumin, 1 to 4 plus with many white blood cells, red blood cells, and granular and hyaline casts present; blood urea nitrogen, 24 mg. percent; phenolsulfonphthalein test, 62 percent excretion in 2 hours; cholesterol, 410 mg. percent; urea clearance, 41.5 percent of standard in second specimen; initial spinal fluid pressure, 210 mm. water; and spinal fluid protein, 83 mg. percent. All other studies including total protein, A/G ratio, serum calcium and phosphorus, chest roentgenograms, and retrograde pyelograms were normal or negative.

A transfusion of 500 cc. of whole blood was given. Prolonged daily administration of sympathetic paralyzant produced no results. Fatigue continued and nausea and emesis became frequent, associated with generalized aching and abdominal pain. The patient continued to lose weight and on his fortieth hospital day was transferred to this hospital.

The patient's weight on admission to this hospital was 110 pounds. The patient appeared acutely ill and ran a progressively downhill course. A soft blowing mitral systolic murmur appeared in conjunction with electrocardiographic evidence of combined heart strain and roentgenographic evidence of accentuation of the left pulmonic artery. The fundi showed an increasingly severe hypertensive neuroretinitis. Urine specimens revealed the abnormal findings noted at the New York hospital. The red blood cell count decreased to 2.75 million. A spinal tap on 15 February 1948 had an initial pressure of 300 mm. water with otherwise normal findings. The total protein decreased to 5.62 gm. per 100 cc. blood with 3.18 gm. albumin and 2.44 gm. globulin. It is noteworthy that repeated determinations of nonprotein nitrogen, urea nitrogen, and creatinine levels in the blood were within normal limits. Urinary output continued at a high level; 1,900 to 3,000 cc. daily. Blood pressure remained elevated. On 18 February 1947 the patient developed severe hiccoughs associated with nausea and vomiting; blood pressure was 250/160. Severe pain in the left flank radiating up over the left chest necessitated the use of analgesics.

On 7 March 1947 involuntary muscle spasms were first noted. On 10 March 1947 the patient had his first generalized convulsion; blood pressure was 224/148. Convulsive attacks continued intermittently. On 17 March 1947 the patient noted that he was unable to read print. On 26 March 1947 vision was lost entirely in the right eye and the light reflex was lost in the left eye. On 30 March the patient developed stertorous respirations; blood pressure dropped to 78/52.

Spinal tap at that time yielded only a slight trace of fluid. Patient was having occasional mild convulsions. Central vasomotor and respiratory failure developed and the patient died on 30 March 1947. The final clinical diagnosis was malignant hypertension.

At autopsy the most pertinent findings were in the adrenals and kidneys. The right adrenal weighed 7 grams and was not remarkable. The left adrenal weighed 20 grams and contained a well circumscribed tumor mass, grayish with hemorrhagic areas, measuring $4 \times 1.7 \times 2$ cm. Around the tumor there was a thin (1 mm. or less) layer of cortical tissue, reduced to nothing but capsule in places. A pole of normal adrenal tissue measuring $2.4 \times 1.7 \times 0.9$ cm. was present at one end of the gland (fig. 1).



Figure 1.—Left adrenal, gross specimen.

On gross examination the tumor appeared to arise from the medulla. Microscopic examination proved it to be histologically a typical pheochromocytoma.

The left and right kidneys weighed 100 and 105 grams, respectively. The capsule stripped with much difficulty revealing a granular surface. There was a moderately severe nephrosclerosis and, in a few areas, a true arteriolar necrosis.

Arteriolar necrosis was also noted in a few vessels in the pancreas and adrenals. One pancreatic vessel showed organizing thrombus, and moderate to marked generalized arteriolar sclerosis was also present.

Other findings included a 2.5 cm. abscess cavity in the left lower lung lobe, hypertrophy of the left ventricle of the heart (weight, 395 grams), minimal coronary artery atherosclerosis, some atheromatous infiltration of the aorta, and slight passive congestion of the liver. The brain was soft with a small cerebellar pressure conus.

COMMENT

Certain features of this case, originally diagnosed as chronic nephritis and terminally as malignant hypertension, are unusual or of special interest since they are rarely seen with pheochromocytomas.

With the exception of the first 4 to 6 months of the patient's illness when, from available information, his blood pressure was normal, the

patient had a persistent hypertension and nothing suggesting paroxysmal attacks of the type seen with hyperadrenalism was found. This fact offered the greatest stumbling block in arriving at a correct diagnosis, particularly when considered in connection with an extremely high sustained hypertension and other findings indicating a diagnosis of malignant hypertension.

The onset of symptoms with nocturia and visual disturbances is unusual. However, the patient was taking benzedrine over a period of months, during the onset of his illness. Goodman and Gilman (14) state that "benzedrine markedly potentiates the pressor response to epinephrine." This fact may possibly aid in accounting for the unusual symptoms and rapidity of progression of the disease in this case.

Certainly, generalized arteriolar sclerosis is not common in this disease. In eight cases with autopsies reported by Howard and Baker (15) all but one had persistent hypertension. Yet three showed absolutely no nephrosclerosis, two only mild nephrosclerosis, and one marked nephrosclerosis.

The presence of arteriolar necrosis, which occurs in malignant hypertension (kidneys, pancreas, and adrenals) is certainly an unusual feature of this case, as is the presence of arteriolar necrosis of the kidneys without uremia. This patient died in coma, convulsions, and apparent failure of the vital medullary centers and not in uremia, although no blood chemistry studies were performed during the last 2 days of his life.

The presence of some arteriolar necrosis and the absence of uremia make this case rather similar to that reported in 1946 by Washington, Callahan, and Edwards (13) from the University of Washington. They postulated that the prolonged discharge of a vasopressor substance into the blood stream may produce arteriolar changes leading to a sustained hypertension and that further release of the vasopressor substance after sustained hypertension has developed may result in the pathologic changes of malignant hypertension.

At the New York hospital, a blood cholesterol level of 410 mg. per 100 cc. was noted. Possibly the hypercholesteremia in conjunction with the sustained hypertension may also account for the lesion seen in the arterioles. It is realized that this is a debatable point.

At any rate, by the time the patient was seen at the last two hospitals, he presented the clinical picture of a true malignant hypertension. In view of the vascular changes found at autopsy, it is felt that even if surgery, subsequent to a correct diagnosis, had been possible, the patient's hypertension would have remained and possibly progressed. Early diagnosis of such cases is therefore emphasized.

Finally, the small size of the tumor is pointed out. The onset of hypertension associated with attacks of visual scotomata and head-

ache should have introduced the diagnostic possibility of the presence of a pheochromocytoma. However, except for the history, certainly the diagnosis only could have been indicated and proved by utilization of one of the tests (9) (11) (12) for pheochromocytoma. Physical examination and roentgenographic studies were of no avail in this case; nor would the tumor have been revealed by a perirenal air insufflation. The importance and utilization of the aforementioned tests therefore cannot be overemphasized.

SUMMARY

1. A case of pheochromocytoma simulating true malignant hypertension has been presented.
2. Benzedrine taken during the onset of the disease may have contributed to the unusual type of onset and rapidity of progression of the disease.
3. Death occurred in coma; convulsions and failure of the vital medullary centers were present without uremia.
4. The case is unusual in that a moderate to severe generalized arteriolar sclerosis associated with some lesions of arteriolar necrosis in the kidneys, adrenals, and pancreas was present.
5. In view of the advanced vascular changes found in this case, early diagnosis, necessitating the utilization of the clinical tests developed for the diagnosis of pheochromocytoma, is emphasized.

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The American Urological Association Award

The American Urological Association offers an annual award of \$1,000 (first prize of \$500, second prize \$300, and third prize \$200) for essays on the result of some clinical or laboratory research in Urology. Competition shall be limited to urologists who have been in such specific practice for not more than 5 years and to residents in urology in recognized hospitals.

The first prize essay will appear on the program of the forthcoming meeting of the American Urological Association, to be held at the Hotel Statler, Washington, D. C., 29 May and 1 June 1950.

For full particulars write the Secretary, Dr. Charles H. deT. Shivers, Boardwalk National Arcade Building, Atlantic City, N. J. Essays must be in his hands before 20 February 1950.



Hemangioma of the Ileum

Review of the Literature and Report of a Case

VICTOR C. STRATTON, *Commander (MC) U. S. N.*

HEMANGIOMA of the gastro-intestinal tract is a rare disease entity and as Kaijser (1) stated in 1936 "every case should be reported so that a clearer understanding of the processes may be obtained." Geschickter and Keasbey (2) reviewed 570 cases of hemangioma at Johns Hopkins Hospital and found only 10 cases involving the internal viscera including the mesentery, kidneys, and the gastro-intestinal tract.

Kaijser's (1) review included 74 cases in the gastro-intestinal tract and of these only 8 were in the ileum. Pierose (3) in 1940 further reviewed and reported 10 more cases in the ileum, one of which was his own case. In a later review, Christopher (4) reported 93 cases of which 14 were in the ileum. In 1945, Polayes and Nevius (5) reported a case of ileal hemangioma which terminated fatally from massive intestinal hemorrhage before a diagnosis was established. This patient had had an unexplained anemia during pregnancy 2 years previously.

Hemangioma may present itself in any one or a combination of three characteristic symptom complexes. These are: hemorrhage, which may be occult or massive; obstruction, which is usually acute but may be chronic; and inflammation of the lesion itself, simulating acute appendicitis. Occasionally, if the lesion is polypoid and large, intussusception may occur.

Diagnosis as emphasized by Pierose (3) in his case report, is never easy. In addition to the previously mentioned complexes, an unexplained anemia in an otherwise normal individual, with occult blood in the stool, should draw attention to the possibility of the presence of an hemangioma in the intestinal tract.

CASE REPORT

E. L., a 22-year-old white male, entered the U. S. Naval Hospital, Long Beach, Calif., with the complaint of abdominal pain, nausea and vomiting of about 15 hours' duration. The pain was cramplike with episodes of remission and exacerbation without complete relief of all pain, and was localized peri-umbil-

ically without radiation. The pain became increasingly severe and about 6 hours after onset, recurrent vomiting occurred. Vomitus contained bile and there was no evidence of gross blood. There was no history of altered bowel habits, melena, chills, or fever. He had had a similar episode about 4 months previously with complete spontaneous recovery. He had had no other illness or injury except an appendectomy 12 years previously with apparent complete recovery. The family history was negative. A review of the systems was non-productive.

Physical examination revealed a blood pressure of 150/90; temperature, 100.0° F.; and respirations, 16. The only pertinent finding was in the abdomen. In the left lower quadrant was a palpable mass approximately 10 × 12 cm. in diameter. It was freely movable, solid, and quite tender. Distention was minimal and bowel sounds were diminished. There was no rebound tenderness. On rectal examination the mass could be palpated bimanually and no blood was noted on the examining finger. A well-healed McBurney scar was present and there were no hernias.

Laboratory findings showed a total white cell count of 24,300 with 5 percent band forms; 81 percent segmented forms; 13 percent lymphocytes; and 1 percent monocytes. Hemoglobin was 14 grams. The urine was normal. The blood Kahn test was negative.

A diagnosis of intestinal obstruction was made and it was thought that the cause was a volvulus due to adhesions from the previous appendectomy.

An emergency celiotomy was performed under spinal anesthesia (procaine, 100 mg. and pontocaine, 10 mg.). A large hemangioma of the mesentery of the ileum was in the peritoneal cavity. It was located about 3 cm. distal to a large Meckel's diverticulum. The larger portion of the tumor had caused a narrowing of the ileum resulting in almost complete obstruction of the intestine. A segmental resection including the Meckel's diverticulum and an end to end anastomosis was done. A thorough search failed to reveal any other tumors and the remainder of the peritoneal contents were normal.

Recovery was stormy with a wound disruption on the seventh day. This was closed with through and through wire sutures. A mild annoying diarrhea of from three to seven stools daily followed for approximately 3 months. Investigation failed to reveal any specific cause. Nutrition was easily maintained and since the patient's return to duty no further episode of diarrhea has occurred.

Histopathological examination revealed a specimen of small bowel and attached mesentery measuring 57 cm. The lumen of the bowel was filled with bloody material. Within the mesentery there was a 12 × 12 × 4.5 cm. lobulated gray mass with extensive hemorrhage. There was a constriction of the overlying bowel. The cut surface showed numerous small spaces filled with blood. The Meckel's diverticulum measured 5.5 cm. from the end. Microscopically, sections of the diverticulum showed characteristic mucosa of the ileum. Section of the ileum overlying the tumor showed a gangrenous wall with extensive hemorrhage. Sections from the mesentery showed the tumor to be composed of numerous large vascular spaces filled with blood. There was also some hemorrhage into the fat. There was no evidence of malignancy.

Pathologic diagnosis: Hemangioma of the ileum; gangrenous ileum, Meckel's diverticulum.

Virchow (6), Ribbert (7), and Fraser (8) believed that, pathologically, the hemangioma is a localized encapsulated tumor. Ribbert (7) found that a cavernous hemangioma consists of vessels with thin walls surrounded by connective tissue stroma containing few cells

and having no direct communication with the capillaries of the surrounding tissue stroma. He further believed that no justification could be found to assume that originally the vessels of the hemangioma were normal components of the vascular complex that later developed into a tumor. He felt that the vascular complex of the new growth is an independent entity from embryonic life.

The greatest incidence of hemangioma is in the second, third, and fourth decades.

In congenital hemangioma, Fraser (8) states that "the syncytium is formed by the mesodermal angioblasts which then become vacuolated. Fluid collects in these enlarging vacuoles giving rise to the so-called 'Pander blood islands.'" The syncytium further develops into the lining cells of the walls of the arteries and veins and a stroma develops binding the vessels together. Occasionally this stroma becomes very abundant thus resulting in a scirrhuslike type of hemangioma. According to Fraser, evolution of the tumor may occur in at least 4 different ways: (a) The growth may be arrested with progressive obliteration of the blood vessels and conversion of the connective tissue stroma into a dense fibrous tissue; (b) retention of capillary hemangioma characteristics but with extensive infiltration of the surrounding tissue; (c) conversion of the original capillary type into a cavernous type; and (d) original capillary type may develop into a compact type due to perivascular and occasionally endovascular proliferation forming concentric masses and whorls.

A clinical pathological classification propounded by Brown (9) is as follows: (a) Multiple tumors of the vascular arcades arising either in vein or artery and being either capillary or cavernous in type; (b) tumors arising in the submucosa growing toward the lumen with possible ulceration or hemorrhage; (c) tumors arising in the submucosa growing to a large size which may cause obstruction; and (d) diffuse ringlike tumors beginning in the submucosa involving the muscularis and constricting the lumen of the gut producing acute or chronic intestinal obstruction. Any of these may occur in any age group.

Kaijser's (1) classification is a practical one, as follows: (a) Multiple phlebectasia (dark bluish-red nodules ranging in size from a pin-head to pea size), scattered throughout the intestine and located in the submucosa, opposite the mesentery, connected to one of the smaller vessels with communicating cavities. These are probably not tumors and produce no symptoms or detectable hemorrhage into the bowel cavity. (b) Cavernous hemangioma; (1) diffusely permeating the gastro-intestinal wall, (2) growing more compactly, thus frequently becoming polypoid (these are prone to obstruct or to hemorrhage).

(c) Simple or capillary hemangioma consisting of a network of dilated capillaries, occurring in the submucosa as a round tumor up to 3 to 5 cm. in size protruding into the canal and covered by normal mucosa. (d) Angiomatosis, multiple angioma varying in structure from the usual cavernous type to one rich in cells and stroma, suggesting angiosarcoma, the intestinal type of which does not infiltrate.

Treatment is primarily surgical with resection of the tumor. Occasionally cases will be found in which the involvement is so great as to preclude resection. In this instance sclerosing agents and radiation therapy have been used but without too much success.

These tumors have a serious prognosis unless resection has been successfully accomplished, since intestinal obstruction or massive hemorrhage may intervene with their attendant complications.

SUMMARY

An additional case of hemangioma of the ileum has been presented; attention has been drawn to the various classifications used; and the three symptom complexes have been discussed. Treatment is primarily surgical with a guarded outlook for those cases too extensive for surgical resection.

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Islet Cell Adenoma

Report of a Case

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THE diagnosis of hyperinsulinism is comparatively easy. However, because these cases are uncommon it is easy to forget the clinical picture.

CASE REPORT

A 24-year-old male gunner in a torpedo bomber began to have convulsive seizures in May 1945. At that time he was seen by a hospital corpsman, in a tonic and clonic convulsive seizure, lasting 4 to 6 minutes, followed by a prolonged series of clonic convulsions.

Upon questioning, the patient stated that he had had two attacks during the past year, both occurring in bed. He stated he had had numbness in his fingertips for days after the seizures. These attacks were associated with emotional upsets; one attack occurred after dental extractions, and another occurred after he had witnessed a fatal accident to three members of his squadron. It was suggested that the severe wounding of his shipmate might have been a factor in the onset of these convulsions.

His past history was essentially negative. He admitted some excitement and apprehension during combat.

Physical and laboratory examinations at that time were essentially negative. Blood sugar studies were not done. He was transferred to a convalescent hospital with the diagnosis of combat fatigue; a note made then stated that he was showing an excellent response to psychotherapy.

In June 1946, while on duty in St. Louis, his wife brought him to a dispensary following a convulsion which occurred while he was taking a nap. After the seizure he was stuporous and had a severe headache. Physical examination at that time was negative. A neuropsychiatrist examined him and noted that: the attacks came on *only* when the patient was asleep; at times, complete amnesia followed recovery from the seizure and numbness and tingling were noted in the fingertips for from 7 to 10 days; he dropped objects at times and was not certain of his grip; his sense of taste was impaired so that he was not able to tell a potato from a tomato. The physician could not make a definite diagnosis but did suggest blood sugar studies; and, following a noninformative sodium pentothal interview, the patient was sent to another hospital, where fasting blood sugars and glucose tolerance tests were reported to be normal. He was sent on leave; while on leave he had attacks on eight successive nights at 3 a. m., and then had no attacks for 3 weeks. The patient agreed that he should return to duty and it was thought that he had hysteria.

In September 1946, while on duty in New York, he "threw a fit" while waiting in line for his noon meal. He began to swear, became confused, his body shook,

and his mouth twitched continuously. He was not incontinent. His breathing was gasping and snorting, without accompanying cyanosis. He had another attack at 4 p. m., and was then transferred to the U. S. Naval Hospital, St. Albans, N. Y.

Upon admission on 30 September 1946, spinal tap with manometric readings was normal; fluid, total proteins, normal, chlorides normal. Fasting blood sugar was 30.0 mg. per 100 cc. blood and nonprotein nitrogen was 28 mg. per 100 cc. blood. A repeat blood sugar was 87.7 mg. Roentgenogram of the skull was negative. Electro-encephalogram showed normal tracings. During a period of almost 2 months, this patient continued to have frequent attacks, he lost weight, and became ataxic and lethargic. His ataxia increased and the finger to nose test was ataxic bilaterally. About this time the right pupil showed dilation and reacted poorly to light. Medical consultants believed that his attacks were due to hypoglycemia (until proved otherwise) and that his cerebellar involvement was due to hypoglycemia. In spite of this opinion a pneumo-encephalogram and another electro-encephalogram were made. Findings were normal.

On 28 January 1947, he had another attack during which the blood sugar was 33 mg. per 100 cc. blood. Twenty cc. of 25 percent dextrose was administered intravenously and he regained full orientation and alertness in from 5 to 10 minutes.

Fasting blood sugar studies on 13, 14, and 17 March were 31, 32.6, and 36 mg. per 100 cc. blood. Hemoglobin, red blood cell count, and nonprotein nitrogen studies were normal. Blood transfusion was given and an operation was done on 27 March 1947.

Operation.—A midline incision from xiphoid to umbilicus was made. The small and large intestines were explored for accessory pancreatic tissue. The lesser sac was opened through the gastocolic omentum. The pancreas was mobilized. Three adenomata were removed, 2 from the tail, 2.0 cm. and 1.0 cm. in diameter, and 1 from the head, 2.5 cm. in diameter. Hemostasis was maintained with 3.0 and 4.0 silk. Closure was performed in layers with 3.0 silk. Drainage was established by placing Penrose drains down to the pancreas.

Post-operative course.—The post-operative course was uneventful. His blood sugar rose to 250 mg. per 100 cc. blood on the afternoon of the operation and was 170 mg. per 100 cc. blood on the morning after the operation. It gradually leveled off and ranged between 85 and 110 mg. per 100 cc. blood. His strength returned and the numbness gradually left his hands and feet. He had some residual ataxia, which was thought to be due to permanent cerebellar damage. The impairment in his sense of taste and the vague visual symptoms disappeared.

DISCUSSION

It is believed that the triad necessary to make a diagnosis of hyperinsulinism was present in this case, namely: (a) The convulsive attack, the stupor, or spell; (b) fasting blood sugar below 50 mg. per 100 cc. blood; and (c) the rapid recovery in response to dextrose given during an attack. It is probable that the earlier determinations of this patient's blood sugar were not really fasting ones, but, being considered such, clouded the issue. When a definite effort was made to obtain fasting blood sugar values, they were all below 36 mg. per 100 cc. blood. When hyperinsulinism is considered, this fact is well worth close observation.

Haefner, Guttman, and Sands (1) point out that, in studying 11 of their 37 patients, they noted definite abnormality in the electro-encephalographic tracings in patients who were examined while fasting. Previously, Wechsler and Garlock (2) in their studies had noted electro-encephalographic changes during the attacks. These abnormalities were corrected after administration of *d*-glucose. These facts emphasize that the abnormal features of physiology are brought out most sharply in the fasting state and they must be observed in this condition. This should be remembered while attempting to diagnose hyperinsulinism. It is unfortunate that in our patient electro-encephalographic studies were not carried out during a fasting period. Haefner et al. (1) stress the point that, as brain tissue derives its energy by the oxidation of carbohydrates alone, periods of hypoglycemia may be as detrimental as periods of anoxemia. They also noted that glucose tolerance curves in their cases were often diabetic in level and pattern.

Rudd and Walton (3) reported a case in which, at first, they did not find any adenomatous tissue lateral to the tail of the pancreas. They removed the distal half of the pancreas after not finding any adenoma. Some excess tissue beyond the tail, which they took along with the pancreas, proved to have an adenoma. They advanced the opinion that, probably all cases of hypoglycemia are due to an adenoma of islet cells, whether or not it is found. This is certainly a radical view, but there is no question that partial resection of the pancreas and the ensuing results leave a lot to be desired. Success in 2 cases following resection of the pancreas was reported by Brush and McClure (4). No adenomata were found, but both cases had clinical improvement.

The most encouraging report of partial resection in hypoglycemia is that of David and Campbell (5). They list 36 patients who underwent resection. In 5 an adenoma was found in the resected portion of the pancreas. Clinical results, as would be expected, were good. Six were found to have hyperplasia, without adenoma, 3 of these were improved. Fifteen of the remaining 25 showed the resected tissue to be normal but the clinical results in these were good. (Eighteen of thirty-one cases (58 percent), in which adenoma was not found, had good results.) In the discussion of this paper (5), Whipple pointed out that resection gave poor results because frequently adenomatous tissue in the head of the pancreas was overlooked. He reoperated 3 cases in which resection of the distal half of the pancreas had been done previously. Tumors were found in the head of the pancreas in each case. Priestly, Comfort, and Radcliffe (6) had a similar case in which they excised the head of the pancreas, all that remained after previous massive resection; an adenoma was found in it. This patient remained in good health by the use of insulin alone.

Frantz (7), in discussing hyperinsulinism, stated that 5 of her 16 patients were found to have no tumor. One was proved to have Van Qierkes' disease; another had no tissue removed but improved! The other 3 had partial resections with poor results.

CONCLUSIONS

In evaluating these facts, it seems logical to conclude that the diagnosis of hypoglycemia should be made as promptly as possible to prevent severe nutritional damage, and especially to conserve nerve tissue. The surgeon should keep in mind that an adenoma is probably present, and there is a good chance that there is more than one. Tumors in the head of the pancreas are most frequently overlooked. Regions where aberrant pancreatic tissue is known to occur should be searched. If no tumor is found, partial resection of the body and tail of the pancreas is indicated, for impalpable tumors, adenomatosis and hyperplasia do exist. Removal of adenomata usually gives excellent results. When resection must be resorted to, the clinical improvement may not be entirely satisfactory.

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Pneumococcal Meningitis

A Review

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THE introduction of chemotherapeutic drugs and antibiotic agents has greatly altered the prognosis and treatment of many infectious diseases during the past few years. Pneumococcal diseases, especially, have yielded to these new agents and pneumococcal pneumonia no longer occupies a preeminent position among the principal causes of death in this country. It might reasonably be expected that these agents would also reduce the incidence of pneumococcal meningitis as well as make the outlook for recovery from this disease more hopeful. The exploration of such possibilities leads to another review (1) of this subject and the results are summarized as follows.

Pneumococcal meningitis is a disease which may be simulated by any pyogenic infection of the meninges; clinical signs and symptoms are not characteristic of the disease. The etiologic agent might be suspected if the presence of pneumococcal disease has been established elsewhere in the body. Inasmuch as pneumococcal meningitis is not a primary disease in more than 20 percent of the reported cases, a search for pneumococcal disease in the lung, paranasal sinus, middle ear, or upper respiratory tract may identify the etiological agent by presumption.

The etiologic diagnosis should depend on an examination of the cerebrospinal fluid (2). The protein content and the number of granulocytes are almost always increased; however, these findings are otherwise not pathognostic of pneumococcal meningitis. Pneumococci must be identified either in an examination of the fluid or from a culture of the fluid. In the past much of the confusion concerning the meningitides has resulted from the slipshod method of identifying organisms by their morphological and tinctorial characteristics. Identification and classification can most often be effected from a direct examination of the spinal fluid by means of the "capsule-swelling" test. (It seems particularly unfortunate that typing of pneumococci has been abandoned by so many hospitals since the intro-

duction of nonspecific therapeutic agents. The pneumococcus is naturally "tagged" by its different capsular polysaccharides and lends itself to rapid identification and typing by means of rabbit anti-pneumococcus sera. Biological characteristics of the pneumococcus and epidemiological data concerning pneumococcal disease will lose much of their meaning if typing of the pneumococcus is permanently abandoned as a routine procedure (3).)

Pneumococcal meningitis may occur in humans of all races. There is no reliable evidence that one race is more susceptible than another. The great number of cases of pneumococcal meningitis reported from South Africa by Ordman (4) adds to the evidence that Negroes may be more susceptible to pneumococcal disease than Caucasians, but the unknown factors and the multiplicity of factors to be evaluated in interpreting these epidemiologic data do not warrant such a conclusion at this time. The disease may occur at any age but almost half of the reported cases occurred within the first decade of life. Pneumococcal meningitis is primarily a disease of younger age groups: one out of five reported cases occurred in infants of less than 1 year of age; 40 percent of the cases occurred during the first decade; and more than 50 percent before the twenty-first year of life. The predominance of males afflicted with the disease follows the pattern noted in pneumococcal pneumonia. Meningitis due to the pneumococcus may occur at any time of the year but its greatest incidence is during the colder months of the year; an incidence graph does not differ greatly from that noted in pneumococcal pneumonia.

As previously stated, pneumococcal meningitis is primary in about 20 percent of the cases. Proof is lacking of the pathogenesis of pneumococcal meningitis as a primary disease; it is quite possible that these cases arise from a cryptic focus of pneumococcal disease elsewhere. Frequently, meningitis occurs secondary to pneumococcal disease of the middle ear, mastoid, paranasal sinus, or some other portion of the upper respiratory tract. Its occurrence as a bacteremic complication of untreated or uncontrolled pneumonia was probably much more frequent before the introduction of the new chemicals and antibiotics than it is today. In the absence of precise epidemiological figures, it is impossible to calculate the incidence of this type of meningitis; more cases were reported during the 1942-46 period than during the previous 15 years but this is probably only a reflection of the increased interest in the disease occasioned by the introduction of penicillin. The frequency with which meningitis occurs as a terminal event or septic complication of pneumococcal endocarditis is well known (5). Meningitis, caused by the pneumococcus, often follows fracture of the bones of the skull or face (6) and has been reported to follow an apparently trivial head injury.

Any type of pneumococcus may cause meningitis under the proper set of circumstances. The relative importance of the various types in the causation of meningitis is summarized in table 1. It has been reported that pneumococci Types I to VIII cause almost 80 percent of all pneumococcal pneumonia (?); yet Types I to VIII were the etiologic agents in only about half of the typed cases of meningitis in this series. Thus it may be seen that the so-called higher types of pneumococci are responsible for a relatively greater number of cases of meningitis than of pneumonia; this interpretation may be illusory because of lack of knowledge concerning a correlation between age groups and types of pneumococci. The pattern of type incidence in this form of pneumococcal disease is not easy to explain. In fact,

TABLE 1

Type	Cases	Mortality (percent)	Significantly different from	Type	Cases	Mortality (percent)	Significantly different from
I.....	131	63.3	VIII.	XVII.....	14	42.8	
II.....	56	78.6	XIX, untyped.	XVIII.....	67	59.5	VIII.
III.....	276	66.0	Untyped.	XIX.....	49	53.0	II, VIII.
IV.....	83	62.6		XX.....	17	70.6	
V.....	69	60.8		XXI.....	13	53.8	
VI.....	64	64.0		XXII.....	13	69.1	
VII.....	71	73.2	Untyped.	XXIII.....	33	72.8	
VIII.....	54	81.5	I, XVIII, XIX, untyped, >XXXII.	XXIV.....	3	100.0	
IX.....	14	64.3		XXV.....	22	59.0	
X.....	29	79.2	Untyped.	XXVII.....	5	80.0	
XI.....	11	72.7		XXVIII.....	12	50.0	
XII.....	64	62.5	Untyped.	XXIX.....	11	45.4	
XIII.....	15	33.3		XXXI.....	6	33.3	
XIV.....	60	70.0	Untyped.	XXXII.....	5	00.0	
XV.....	7	57.1		>XXXII.....	30	53.4	VIII.
XVI.....	6	50.0		Group IV.....	32	62.5	
				Untyped.....	405	45.0	II, III, VII, VIII, X, XIV.

until more is known concerning the carrier state and certain other epidemiological data, our knowledge concerning the pathogenesis of pneumococcal infections in general will be imperfect. The association of disease of the upper respiratory tract, including the ear and paranasal sinuses, and pneumococcal meningitis is reflected in the high incidence of Type III infections; this type of pneumococcus has been found frequently in frank and cryptic disease of the upper respiratory tract. Likewise, the frequent incidence of meningitis as a complication of pneumonia may explain the high incidence of Types I to VIII, XIV, XVIII, and XIX, since these types are found most frequently in pneumonias of all ages. The relatively great incidence of cases caused by Type XII pneumococcus is difficult to explain; this type has not been a common cause of pneumonia in either adults or children; nor has it been recorded as a frequent "carrier" type. The incidence of the "higher types" in meningitis following skull fracture and head injuries might be expected, for these types are more frequent among normal carriers than among patients with frank pneumococcal

disease. The "higher types" also predominated in primary meningitis; it seems more reasonable at present to conclude that these types cause meningitis by reason of enhancement of their invasiveness and are less likely to cause frank disease elsewhere in the body.

The simultaneous infection of the meninges by two or more different types or kinds of organisms is extremely rare. Undoubtedly many purported instances of such multiple infections are due to lack of precise methods of bacterial identification.

The rarity with which bacteremia due to two or more different organisms is seen even in pneumonia, apparently due to a multiple infection, should caution great skepticism in accepting a diagnosis of meningitis due to two or more organisms. Likewise, meningitis following skull fracture, in which massive seeding of the meninges by a host of organisms can occur, is practically always monovalent in its bacterial cause. A further explanation of multiple types of pneumococci as the causative agents of pneumococcal disease lies in the cross-reacting factor of the diagnostic sera. Thus Eriksson and Sjöberg (8) reported a case of meningitis caused by Types II and XX pneumococci; there is known to be a component in the antigen of these two types and it is possible that this fact explains the apparent bivalency of the etiological agent. Numerous cases of relapse and recrudescence have been reported in the literature, but there have been only 8 cases of reinfection reported. There is no reason to believe that these are not genuine instances of reinfection due to different types of pneumococci; the exclusive participation of the "higher" types, among which the sharing of a common antigen is more frequent, raises the question of the ability of the pneumococcus to undergo mutation within the human body. The types responsible for reinfections as cited by others were as follows: (9) types XVII and XXVIII; (10) XVII, XXV, and >XXXIII; (11) X and XXV; (12) XVII and XXXII; (13) XI and XXII; (14) XI, XVII, and XXXIII; (15) XII and XVIII; and (16) XV and XXI.

TREATMENT

The introduction of the newer therapeutic agents has largely eliminated the elaborate regimens which formerly were employed in the treatment of pneumococcal meningitis. Only penicillin and possibly one of the sulfonamides are needed for the successful treatment of the disease today. Penicillin should be administered parenterally: 20,000 to 50,000 units of an aqueous solution of crystalline penicillin injected intramuscularly every 3 hours constitutes an adequate dosage in the vast majority of patients. The role of the slowly absorbed penicillin preparations in the treatment of pyogenic meningitis awaits evaluation. Total dose of penicillin cannot be stated dogmatically: many successful clinicians (17) (18) (19) (20) advise the continuance

of the 3-hour injections until the patient has been afebrile for from 2 to 7 days. Likewise, the indication for intrathecal therapy cannot be stated arbitrarily; the relatively poor diffusion of penicillin into the cerebrospinal fluid early indicated the desirability of administering the antibiotic intrathecally. Several untoward results have been noted following the intrathecal injection of large doses of penicillin (21) (22) (23) and such reactions can be duplicated experimentally in animals (24) (25). On the other hand, several case reports (23) have appeared in which patients received either large doses intrathecally or moderately large doses repeatedly without evidence of permanent damage to the central nervous system. Most observers (26) (27) (28) (29) (30) now believe that the intrathecal injection of 10,000 to 20,000 units of penicillin (1,000 to 2,000 units per cc.) may be accomplished without risk of injury or reaction. Since intrathecal therapy is not without its dangers (31) (32), it should be attempted only under sterile precautions and should be discontinued when the spinal fluid is sterile. However, parathecal administration of penicillin should be continued for several days following the patient's apparent recovery from the disease (33) (34).

Similarly, a moot point concerns the number of lumbar punctures (35). It is no longer thought that drainage is an important factor in recovery from pyogenic meningitis. Many successful clinicians use this procedure only for diagnosis, while others employ it additionally as an index of the adequacy of intrathecal therapy, as noted previously.

The simultaneous administration of one of the sulfonamides is an accepted therapeutic measure in pneumococcal meningitis. The relative certainty of absorption from the gastro-intestinal tract and the diffusion of the drug across the blood-brain barrier constitute good theoretical grounds for the use of these drugs in pneumococcal meningitis. Sulfadiazine has been the sulfonamide of choice in the great majority of cases; this drug should be administered by mouth, subcutaneously, or intravenously but not intrathecally. A daily dose of 4 to 6 grams seems adequate in adults and the dosage has usually been continued for 1 to 2 weeks after the discontinuance of penicillin therapy (36) (37) (38) (39) (40).

Before the advent of chemotherapeutic agents, the drainage or elimination of the primary pneumococcal focus was fundamental in the successful treatment of pneumococcal meningitis; even after the introduction of the sulfonamides, this procedure seemed of paramount importance. Today, the evidence for the necessity for prompt surgical intervention (41) (42) is much less impressive. The condition of the patient and the relative accessibility of the primary focus should be weighed in the individual case before answering this question. The relatively efficient action of penicillin even in the presence of large

accumulations of pus would certainly not justify a major surgical procedure in an acutely ill patient.

RESULTS OF TREATMENT

Previous to the introduction of the sulfonamides, recovery from pneumococcal meningitis was a most unusual occurrence. The mortality of this disease was in excess of 95 percent in 1935, although the tendency to report small series of cases and individual recoveries made the reported mortality of the combined series distinctly less than 95 percent (1). It is still not possible to make more than an approximate estimate of the mortality of this disease today. Table 1 summarizes the cases of pneumococcal meningitis indicating the case fatality by types as reported in all the accessible medical literature for the years 1927-46. If Ordman's series (4) of 697 fatal cases is included, it may be shown that during the 2-decade period, 7 of 10 patients with this disease died. While the mortality must be considerably less today, the collected cases in the 5-year period of 1942-46 still show a mortality in excess of 50 percent. The modern treatment of pneumococcal meningitis even under optimal conditions has not justified the optimistic hope expressed frequently during the past few years (43) although several small series of cases with only 15 to 20 percent mortality have been published (44) (45).

It is difficult to evaluate the various factors influencing the outcome of this disease. Occasionally dramatic recoveries are published in which the patients have been in coma before treatment was instituted, but every clinician is agreed that the early institution of penicillin therapy is the keystone of any program to diminish the mortality of this disease (46) (47); and the corollary to that principle is early diagnosis (48) (49). Probably more important is the early suspicion of the diagnosis with subsequent examination of the cerebrospinal fluid.

The age of the patient is a large factor in determining the outcome of the disease and this fact can be appreciated by reviewing the case fatality figures of table 2. Thus infants of less than 1 year of age

TABLE 2

	Died	Recovered		Died	Recovered
Age:					
Less than 1 year.....	173	103	Positive blood culture.....	169	93
1 to 10 years.....	113	158	Negative blood culture.....	64	109
11 to 20 years.....	53	120	Primary.....	98	115
21 to 30 years.....	57	67	Head injury.....	7	21
31 to 40 years.....	63	76	Skull fracture.....	25	31
41 to 50 years.....	99	58	Pneumonia.....	109	40
51 to 60 years.....	82	32	Otitis media.....	174	188
61 to 70 years.....	56	9	Sinusitis.....	50	43
71 to 80 years.....	11	7	Upper respiratory infection.....	28	27
81 to 90 years.....	4	1			

show a mortality rate of 62.8 percent while 41.7 percent of children of 1 to 10 years died, a statistically significant difference. Patients in the age groups of 1 to 40 years had a case mortality rate of 40 percent but the rate for the fifth and subsequent decades is significantly greater. Sex apparently is not a factor determining the outcome of this disease.

An examination of the pathogenetic causes of meningitis discloses no significant difference in mortality between the patients with primary disease and those whose meningitis followed pneumococcal disease elsewhere. If the secondary cases are classified, it may be observed that the mortality among those with head injury and skull fracture, 38.1 percent, does not deviate significantly from the primary group, 46.4 percent, or from the group with meningitis secondary to otitis media, mastoiditis, sinusitis, and upper respiratory disease, 49.4 percent. However, those with antecedent pneumonia had a mortality of 73.2 percent, a figure significantly greater than that for any of the other 3 groups. Similarly, the presence or absence of bacteremia (43) is of considerable import in determining the outcome. In this series of collected cases, the results of a blood culture taken before therapy was instituted were recorded in 426 cases; 63.2 percent of those with bacteremia died while only 37 percent of those with a negative blood culture died, a difference not likely to be considered fortuitous. The observation concerning the apparent influence of pneumonia on the outcome lends weight to the latter observation for bacteremia must be postulated when meningitis is secondary to pneumonia.

The type of pneumococcus causing the disease probably does not exercise much influence over the outcome although certain statistically significant differences in case mortality rates defy explanation. Only groups containing 20 or more cases were subjected to significance test ($x/\epsilon > 2.5$). In referring to the differences listed in table 1, those occasioned by the untyped pneumococci can probably be explained by the heterogeneous group of organisms classified as pneumococci on the basis of their tinctorial and morphologic characteristics. Thus only those groups caused by Types I, II, VIII, XVIII, XIX, and >XXXII require explanation for the disparity in their case mortality rates, and of these, Type VIII accounts for the disparity in 5 instances. Possibly, a further breakdown of these groups would disclose an over-weighting of bacteremia, pneumonia, or some similar factor; at present, the significantly greater mortality rates in Types II and VIII are inexplicable.

The comparative efficacy of the new therapeutic agents is apparent from table 3; thus 73 percent of the patients receiving only the sulfonamides died while slightly less than half of those treated with penicillin succumbed to the disease; this difference is statistically significant. A still greater and significant diminution in the case

mortality rate was effected among 224 patients when penicillin and one of the sulfonamides were administered simultaneously. Thus, the theoretical advantage of combining penicillin and sulfonamides in the treatment of pneumococcal meningitis appears to be confirmed by clinical trial.

TABLE 3.—*Treatment*

	Died	Recovered		Died	Recovered
Sulfonamide only.....	270	101	Sulfonamide and serum and penicillin.....	1	5
Penicillin only.....	78	80			
Sulfonamide and penicillin.....	66	158			
Sulfonamide and serum.....	72	52	Total sulfonamide cases.....	409	330
			Total penicillin cases.....	156	239

SUMMARY

The published literature concerning 2,400 cases of pneumococcal meningitis has been reviewed. Pneumococcal meningitis does not present a characteristic group of symptoms; it requires bacteriological diagnosis. The disease, formerly almost always fatal, can be cured by the prompt administration of penicillin and one of the sulfonamides. Prognosis depends upon the age of the patient, the pathogenesis of the disease, the duration of the disease before institution of therapy, and the presence or absence of bacteria.

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Clinical Case for Diagnosis

WILMOT F. PIERCE, *Commander (MC) U. S. N.*

A 33-year-old Negro male was admitted to a naval hospital on 27 August 1948, complaining of cough, fever, general malaise, and abdominal and chest pain. The symptoms began with what he thought was a "bad cold" 10 days previously and had steadily increased in severity. He had worked for the first 3 days of his illness but had stayed at home in bed during the remaining 7 days. The abdominal and chest pains were not localized but seemed to be a part of the generalized body aches and pains. There had been a weight loss of 8 pounds during the preceding month. There was no history of any previous serious illness, but he was, admittedly, a heroin addict, and there was a history of alcoholism. For the 2 months prior to his admission to the hospital, he had indulged in his addictions quite regularly and had been sleeping no more than 2 or 3 hours a night.

On admission, his temperature was 104.8° F.; pulse rate, 132; respiratory rate, 36; and blood pressure, 112/52. He was well developed and well nourished but in moderate respiratory distress, and his breathing was rapid and shallow. The mucous membranes of the nose and pharynx were red and edematous; there was enlargement of the lymph nodes in the posterior cervical chains; there was evidence of pneumonitis; no heart murmurs were heard; there were no unusual precordial pulsations or thrills; some muscle guarding was present in both quadrants of the upper abdomen; and he complained of tenderness along both costal margins. Five superficial scars varying from 0.5 to 2.0 cm. in diameter were present on the skin of the ventral surface of his right forearm and one just above the elbow. There were no other significant abnormalities on physical examination.

Laboratory examination on admission.—Red blood cells, 4.01 million; hemoglobin, 80 percent; leukocytes, 32,500 with a distinct shift to the left in the granulocytes; 20 mg. albumin per 100 cc. urine together with 1 to 3 granular casts and 3 to 4 leukocytes in the sediment per high dry microscopic field; blood sedimentation rate, 23 mm./1 hr.; sputum, negative for acid-fast organisms and for typing with pneumococcal antisera, but positive for *Staphylococcus aureus* and *Neisseria catarrhalis* in cultures. Roentgenograms of the chest showed a diffuse mottled region of increased density in the upper lobe of the left lung with accentuation of the hilar shadows and a similar density in the lower lobe of the right lung, which were interpreted as suggestive of pneumonia. Blood drawn for culture on admission was reported positive for *Staphylococcus aureus* 2 days later.

Other laboratory examinations revealed a negative blood Kahn reaction; no serum agglutinins for *B. abortus*, *P. tularensis*, or *B. proteus* OXK and OX19; and no malarial parasites in numerous blood smears. There was a positive agglutination for *S. typhosa* in a 1:10 dilution and for *S. paratyphi* in a 1:80 dilution. The presumptive Davidsohn test for heterophile antibodies was positive in a dilution of 1:7. A second blood culture on 2 September 1948, was positive for *Staphylococcus aureus*.

Oxygen and penicillin were given from the outset with no noticeable effect on the progress of his illness. A septic type of fever with daily peaks of 102° to 106° F. occurred during the first 3 days, and following this, there were daily peaks of 99° to 102° F. A second roentgenogram of his chest on 30 August showed extension of the previously noted process to all lung fields. It was more distinct on the right than on the left, and multiple cavitation was suggested in the lower lobe of the right lung. On 1 September streptomycin was administered, but this also was ineffectual in checking the infection. His cough and respiratory distress increased and the sputum became blood streaked. His sensorium became clouded, and he died on 19 September 1948, the nineteenth hospital day.

CLINICAL DISCUSSION

The existence of a staphylococcic septicemia in this patient was evident from the clinical course, the remittent fever, and the positive blood cultures.

From the history and physical examination, two possible portals of entry for the bacteria were suggested: (a) the respiratory tract; and (b) direct intravenous introduction during the injection of heroin. The scars on his right arm attested to this manner of administering the drug. Septicemia secondary to infection of the upper respiratory tract usually follows acute fulminating infections, sinusitis, or peritonsillar abscess, or occurs as a complication of tonsillectomy. However, none of these conditions existed in this patient. Septicemia complicating pneumonia is most frequent in the lobar type, but in this patient the physical examination, the temperature curve, and the first roentgenogram of the chest were not in accord with the usual observations noted in this disease, and the cavitation of the lung noted in the second roentgenogram was indicative of liquefaction of septic infarcts rather than of a primary pneumonia. Other portals of entry in staphylococcal septicemia, such as skin infections, osteomyelitis, genito-urinary tract infection, or phlebitis, were not present.

It is widely known that aseptic or antiseptic techniques are not employed by heroin addicts in their use of syringes and needles. Frequently, during a collective debauch, several persons use the same equipment, passing it from one to another with no attempt at sterilization or even cleanliness. There was no suggestion of phlebitis, old or new, in the right arm nor of a recent infected lesion of this arm. The rational conclusion is that there was direct introduction of the staphylococci into the blood stream. The roentgenographic examinations, the cough with the blood-streaked sputum, the respiratory distress, and the positive cultures of the sputum were consistent with multiple septic infarcts of the lungs, a frequent complication of staphylococci septicemia. In the absence of phlebitis, septic emboli to the lungs from acute vegetative bacterial endocarditis of the tricuspid valve is the best possibility. No other embolic phenomena were evident. This is in accord with limitation of endocarditis to the right side of the

heart because of the filtering out of gross emboli by the capillary blood vessels of the lung. However, injury to tissues by the circulating bacteria and their products may be expected and in this patient renal damage was indicated by the results of the examination of the urine. Bacterial invasion of the brain may also have occurred, but it is more likely that the clouding of the sensorium noted late in the course of the disease was secondary to the general toxic state and anoxia resulting from parenchymal damage to the lungs.

Clinical diagnosis.—Staphylococcic septicemia; vegetative endocarditis of the tricuspid valve; multiple septic infarcts of the lungs; abscesses of the lower lobe of the right lung; and acute diffuse nephritis.

Pathologic diagnosis.—(a) Staphylococcic septicemia with vegetative endocarditis of the tricuspid valve; (b) multiple abscess of both lungs; (c) acute pleuritis of both lungs; (d) hydrothorax, right, 300 cc.; (e) septic spleen; (f) mild interstitial nephritis; (g) mild toxic nephrosis; and (h) multiple healed scars, right arm.

PATHOLOGIC DISCUSSION

While solitary lesions of the tricuspid valve are rare in any type of endocarditis, Hussey, Keliher, Schaefer, and Walsh (1) and Wilhelm, Hirsh, Hussey, and Dowling (2) have reported vegetative endocarditis of this valve alone in six of seven heroin addicts in whom staphylococcic septicemia developed after intravenous injections of this drug. Three of the patients died, and in each of these, septic infarcts of the lungs were found in addition to the tricuspid valve endocarditis. Recovery occurred in four after treatment with sulfonamides or penicillin, and in three of these a clinical diagnosis of tricuspid endocarditis was made because of the course of the disease and the development of a systolic murmur in the tricuspid region. No murmurs were noted in the case under discussion, but signs of organic heart disease are often lacking when the tricuspid is the only valve involved (3). The occurrence of septicemia in narcotic addicts is infrequent (1), and this is surprising considering the usual lack of antiseptic or aseptic technique in the self-administration of this drug. Hussey, et al. (1) list several possible modes by which blood stream infection may occur in such individuals: (a) the material used may contain pathogenic bacteria, and since one of the common adulterants used by addicts to add bulk to heroin is lactose, the mixture may be an improved culture medium; (b) the unsterilized and uncleansed equipment used in the administration of the drug even in its passage from one addict to another; (c) the failure to apply an antiseptic solution to the skin before injection with the resultant intravenous introduction of organisms inhabiting the skin; and (d) the development of local abscesses at the site of injection which may result in blood stream infection if the local defenses break down.

Lesions of the tricuspid valve alone, according to statistics compiled from the literature by Karotkin and Marcuse (3) occurred in acute bacterial endocarditis in 3.6 percent of 778 cases and, in association with other valves, in 4.1 percent. In subacute cases, this valve alone was involved in 2.8 percent of 350 cases and involved together with other valves in 5.1 percent. In discussing 122 cases of *Staphylococcus aureus* bacteremia observed at the Boston City Hospital over a 7-year period, Skinner and Keefer (4) found a mortality of 81.97 percent. The portal of entry was the skin in 57, respiratory tract in 30, bones in 11, genito-urinary tract in 11, circulatory system (phlebitis) in 1, and unknown in 13. Acute endocarditis occurred in 7 of the 122 cases. In these the mode of entry was unknown in 5, through the skin in 1 and through the genital tract (puerperal sepsis) in 1. All of these patients died. The valves involved in the cases of acute endocarditis in this series are not mentioned except in a detailed report of 1 case, and, in this case, the tricuspid valve alone was damaged. These authors state that, while endocarditis is infrequently encountered at necropsy as a feature of rapidly progressing sepsis, it is sufficiently common to make one consider it as a possible focus of infection in any patient who has repeatedly positive blood cultures without localizing signs, and they state also that in cases of endocarditis the course of illness may be so rapid that the patient dies before there is destruction of the valves, and that in such cases cardiac murmurs are absent.

Old rheumatic heart disease, congenital lesions of the valves, or mechanical strain of the right side of the heart as in pneumonia, as predisposing influences, are probably of little influence in determining the location of the endocarditic lesions on the tricuspid valve (3). The involvement of the right side of the heart alone in acute rather than subacute infectious processes suggests more than the virulence of the organism as the predisposing factor of importance (5). The isolated involvement of the tricuspid valve in heroin addicts may be further determined, as suggested by Wilhelm et al. (2), by the introduction of the organisms directly into the veins so that they reach this valve first and in great numbers.

The mortality in *Staphylococcus aureus* infections remains high, but Wilhelm et al. (2), in reviewing the literature, report 5 recoveries in 25 patients treated with penicillin. They report 7 patients of their own treated with penicillin with 3 recoveries. *Staphylococcus aureus* was the infecting organism in 2 of their series and *Staphylococcus albus* in 5. Recovery occurred in 1 of the former and in 2 of the latter. These 3 recoveries were in heroin addicts. Since the disease was suspected in such individuals when they were admitted to the hospital, because of previous experience with addicts, therapy was instituted early before the infection became uncontrollable.

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THE PHYSICIAN MUST KNOW
WHAT HIS PREDECESSORS HAVE
KNOWN IF HE DOES NOT WISH TO
DECEIVE BOTH HIMSELF AND
OTHERS.—*Hippocrates*.

EDITORIALS



Shock and Blood Transfusions

The blood volume of the average size man of 150 pounds is approximately 6,000 cc., or equal to about 40 cc. of blood per pound weight. Whole blood makes up one-eleventh of the body weight. The average normal man can lose 500 to 600 cc. of blood without ill effects and can tolerate a loss up to 1,200 cc.; however, shock appears after the loss of more than 1,500 cc. blood.

The output of the normal heart is about 5,000 cc. per minute thus the circulation can easily handle a transfusion at the rate of 100 cc. per minute, until the blood volume is restored.

When bleeding occurs to an extent that the circulatory volume is diminished, fluid from the extravascular tissues is slowly drawn into the vascular system and thus restoration of normal circulatory volume occurs; however this hemodilution does not occur when the hemoglobin level is less than 20 percent. Conversely, when the circulatory volume is increased (the intravenous administration of fluids) a balance occurs by the escape of excess fluid into the extravascular tissues and also by excretion through the kidneys and the skin.

Circulatory volume loss of sufficient degree to produce shock also occurs following dehydration in diarrhea or sweating and vomiting; traumatic injury to the chest; traumatic injury to the abdomen; intestinal obstruction; mesenteric thrombosis; in burns; in crushing injury; and in pneumonia. In all these conditions except the first the loss of a large volume of circulating plasma occurs.

In shock which follows severe trauma, the decrease in the circulating blood volume is associated with hemodilution because whole blood is lost from the circulation at the site of injury. Previously it was believed that this volume loss was due to an escape of plasma into the tissues because of increased capillary permeability. However it has been shown by the use of tagged radioactive plasma protein, that circulating plasma protein in traumatic shock in dogs does not escape

at a rate exceeding that which occurs in the normal. Apparently capillary permeability is not altered in shock.

Keith's clinical observations and studies, in 1919 showed a definite relationship between blood volume reduction and symptoms and degree of shock. He found that cases of wound shock fall into three groups.

Group I.—The patient's general condition is good and he has no distressing symptoms. Pulse rate, 90 to 110; systolic blood pressure remains above 95 mm. Hg.; the pulse pressure may be lowered. The blood volume is never below 75 percent of normal. The plasma volume does not show a proportionate reduction, being 85 to 90 percent of normal.

Group II.—General condition serious. Pulse rate 120 to 140; systolic pressure usually 70 to 80 mm. Hg; pulse pressure lowered; blood volume, 65 to 75 percent; and plasma volume, 70 to 80 percent.

Group III.—Dangerously ill. Pulse impalpable; systolic pressure, 60 mm. Hg or less; and heart rate, 120 to 160. In certain cases the heart rate falls below 100; when this occurs the outcome is invariably fatal. Blood volume below 65 percent of normal, frequently 50 to 60 percent. Lowest plasma volume obtained was 62 percent.

Clinical recovery from wound shock is associated with an increase in blood volume, which may take place with or without intravenous infusion. As an example, in the normal individual the withdrawal of up to 800 cc. blood is followed by a rapid return of original volume within an hour; in fact this compensating process of supplying fluid to the circulation may result in excess blood volume.

In severe shock even without hemorrhage there is a failure of the mechanism of rapid restoration of fluid to the vascular system. Further, the mechanism of shock involves, in addition to those factors related to skeletal trauma and the concomitant loss of blood volume, a decrease in right auricular pressure, which in turn brings about a decreased cardiac output and a decrease in blood pressure. If hypotension is prolonged the venules dilate, vasoconstriction lessens, blood flow becomes slow, and the blood pressure becomes so low that there is insufficient pressure to sweep the blood forward into the veins and into the auricle in sufficient volume. Finally the arterioles and the precapillaries lose their tone and the red cells stagnate in the dilated atonic venules and capillaries. Many capillaries are entirely out of circulation. The large blood vessels remain constricted until death.

CRITERIA IN BLOOD TRANSFUSION

How to make an immediate estimate of the amount of blood volume lost is difficult. However, there are some broad indications of value in estimating blood loss. If the systolic blood pressure re-

mains below 100 mm. mercury a definite indication for transfusion is present. A systolic blood pressure of less than 90 mm. is the most constant clinical sign of shock. If the systolic blood pressure remains persistently below 95 mm., approximately 35 percent of the blood volume has been lost; if the systolic pressure remains between 70 and 90 mm., about 40 percent of the blood volume has been lost.

If from 500 to 750 cc. of blood (10 to 15 percent of the volume) are lost rapidly, only faintness and pallor ensues followed by rapid recovery. No transfusion is required. If from 750 to 1,250 cc. of blood (15 to 25 percent blood volume) are lost, symptoms of moderate shock appear and persist (rapid pulse, collapsed veins, systolic blood pressure below 100 mm., apathy or apprehension, pallor, cold extremities, sighing respiration, nausea, and vomiting). If from 1,250 to 1,750 cc. of blood (25 to 30 percent blood volume) are lost, symptoms of severe shock ensue. If more than 1,750 cc. of blood (over 35 percent blood volume) are lost, the circulatory efficiency degenerates rapidly and death follows unless a large quantity of blood is transfused immediately and rapidly.

In giving blood the following should be considered: (a) The hemoglobin or red blood cell estimation immediately after hemorrhage will be of no value in estimating blood loss. In fact, a high hemoglobin immediately after hemorrhage indicates a grave prognosis because it indicates failure in the mechanism of circulatory volume replacement.

The hematocrit is of little value in the early hours following hemorrhage. Hemodilution is a relatively slow process and if the hematocrit reading is made the basis for indication for transfusion, precious hours when treatment is successful will be lost.

(b) Only compatible cross-matched blood should be used. Severe and even fatal reactions have occurred after the transfusion of so-called Universal Group O blood.

(c) If blood transfusion is considered necessary, not less than 1,000 cc. of blood will be required to establish normal circulatory volume. In case of severe hemorrhage the initial 500 cc. of blood should be given in 10 minutes or even less. When the systolic blood pressure reaches 100 mm. Hg, the transfusion should be slowed to a drip at the rate of about 200 cc. per hour.

(d) If the initial systolic blood pressure is below 60 mm., at least 2,000 cc. must be given at the rate of about 140 cc. per minute. The danger of overloading the heart of a patient who has suffered an abrupt and rapid loss of blood volume is remote. The danger in giving blood in hemorrhage is in not giving enough blood rather than in giving too much.

(e) Each unit of 500 cc. of blood raises the systolic blood pressure by about 10 to 20 mm.

(f) In apparent death or in those dying from hemorrhage, recovery may follow direct arterial transfusion or an intracardiac injection of 500 cc. of blood; the needle is inserted to a depth of 6 to 7 cm. in the fourth left interspace 3 cm. from the sternal border.

(g) If blood is not immediately available, up to 1,000 cc. of plasma or an equivalent amount of albumin may be used. If only a limited amount of blood is available the blood may be diluted in the proportion of 1 part blood to 3 parts isotonic saline solution. Concentrated solutions of plasma or purified albumin should not be used in the treatment of shock except in the presence of head injuries or in cerebral edema.

CLINICAL AND THERAPEUTIC OBSERVATIONS

The head down position is of therapeutic value in that it improves the arterial blood pressure; however, it is contra-indicated in thoracic or abdominal trauma and in head injuries.

The sympathomimetic drugs are of no clinical value in shock; although they produce a transient rise in the arterial and venous pressure, the cardiac output is decreased and no clinical improvement occurs.

Adrenocortical extract is ineffective in shock.

The patient in shock must be treated so as to conserve body heat; it is important not to add external source of heat to the body. Cold is protective because of its vasoconstrictive effect; it reduces fluid loss and inhibits infection. This has been demonstrated in experimental muscle crush in dogs. If the environmental temperature after muscle crush is from 76° to 80° F., gas formation and fever occurs rapidly and early death ensues; at environmental temperatures of from 60° to 68° F. gas formation is inhibited; in environmental temperatures of 60° F. the mortality in experimental muscle crush in dogs is reduced to 0 percent from 100 percent at environmental temperature of 82° F. Further, if the crushed leg is refrigerated even though the room temperature is 82° F., survival occurs.

Morphine, one-sixth gram intravenously, is of great value but only for the relief of pain in shock and is safe except in cases of cerebral injury.

In shock, subcutaneous or intramuscular injections are not absorbed well until the circulation is improved. In cases where repeated doses of morphine had been given the entire amount will be absorbed when shock has been overcome; and then symptoms of morphine poisoning will occur.

The response of the patient is of prime importance in evaluating the amount of blood required and therefore constant observation of the

patient in shock is of extreme importance in determining the course of treatment.

Normal oxygen tension in arterial or venous blood does not prevent or cure shock. In shock many capillary beds are out of circulation and oxygen cannot reach stagnant areas. Oxygen therapy is of value in pulmonary injury or cardiac disease; however it cannot benefit tissues deprived of blood supply.

In shock following abdominal injury, instead of hemodilution, hemoconcentration occurs because of exudation of a large quantity of peritoneal fluid; the blood pressure is maintained at a normal level because of vasoconstriction and increased viscosity of the blood.

In head injuries blood pressure remains normal or may be elevated, and the blood flow is accelerated. In instances of chest or head injuries, blood should be given cautiously and the patient observed carefully for evidence of cardiac embarrassment and/or pulmonary or cerebral edema.

In traumatic or hemorrhagic shock the loss of a large volume of blood evokes a constriction of the arteries and veins; the frequency and amplitude of the vasomotion of the arterioles and the precapillaries is increased and their normal sensitivity to epinephrine is increased.

Tissue edema in burns produces a salt (sodium) and water deficit. The resulting hemoconcentration and oligemia can, therefore, be best treated by the administration of 8 to 10 liters of saline solution during the first 48 hours. After 48 hours plasma volume increases and circulatory congestion may occur if fluids are forced. A normal urinary output is an indication that therapy is adequate.

Physiologic saline or similar solutions of crystalloids alone should not be given in the presence of shock or in severe shock even in the presence of moderate dehydration particularly if plasma proteins are diminished. In such cases crystalloid solutions dilute the already diminished plasma proteins which in turn permits further capillary fluid loss.

BLOOD SUBSTITUTES

In the absence of blood or plasma, a solution of osseous gelatin (Knox) is the next best agent for maintaining osmotic pressure of the blood. Gelatin is nonantigenic and is effective in treatment of shock. It is not usually deposited in tissue cells in contrast to acacia and pectin which are deposited in liver cells and which may damage liver cells or impair liver function. Fifty percent of the gelatin solution is lost in the first 8 to 12 hours and the remainder in the next 5 days.

Bovine albumin can be utilized although a certain amount of antigenicity remains even in its crystallized form. Heyl and Janeway report one death from myocardial failure among 60 volunteers receiving

25 gm. recrystallized bovine albumin. In 24 volunteers fever, purpura, hepatic, renal, and cardiac damage were noted 10 to 23 days after parenteral injection. Many of these patients showed no demonstrable circulatory antibodies to bovine albumin and some recovered even though bovine albumin was still demonstrated in the blood.

State, et al. recently reported 469 injections of bovine serum albumin in 410 patients. In 2.9 percent immediate anaphylactic pyrogenic reactions were noted, while in 9.2 percent delayed reactions manifested by fever, arrhythmia, urticaria, and erythema occurred 12 to 24 days after injection. The use of 1 gm. procaine in 250 cc. saline solution injected intravenously over a period of 1 hour gave excellent relief to the most severe reactions. Although bovine albumin gives excellent results in shock therapy, they do not recommend its use until it be further despeciated.

Edwards despeciated bovine plasma by heating it to 72° C. for a period of 30 minutes in the presence of 0.2 percent formalin and 0.34 percent ammonia. An albumin solution was produced which did not evoke an immediate or delayed reaction when given in large doses.

Melka et al. used formalin in ammonia hydroxide and heat to denature calf plasma. They state that the plasma must become opalescent when viewed against a dark background otherwise there is no proof that it has been denatured. They claim that this method of denaturing calf plasma thoroughly drives out all antigens; that it does not contain agglutinins for the human red blood cells of groups, A, B, AB, nor does it hemolyze the red cells. It does not produce precipitins against the proteins in either rabbits, guinea pigs, or the human body, and that they cannot produce anaphylactic shock in the sensitive guinea pig with denatured calf plasma. They state that cases of intolerance to denatured calf plasma injections are very rare and that it is a satisfactory substitute for blood plasma.

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Mortality in Appendicitis

Tanturi and Anderson¹ experimentally ligated the base and the blood vessels of the appendix in dogs and artificially walled off the area by suturing a polythene sack to the cecum. The gangrenous mass was removed after 72 hours and 92 percent of the dogs survived. When the gangrenous appendix was removed after 48 hours and no polythene sack had been previously placed over it, the mortality was 100 percent.

They cite two theories regarding the causes of death in appendicitis: (a) The local site of infection or the gangrenous appendix forms a favorable medium for the synergetic growth of bacteria which produce a fulminating infection or toxemia; and also that the products of autolytic digestion are an important factor in toxemia; and (b) that a generalized systemic alteration is activated early in the disease with resulting depletion of hepatic function and other vital processes.

These workers have shown that three bacterial enzymes are present in the exudate from the gangrenous appendix: (a) streptokinase which prevents a fibrin deposition by its lysing effect on this protective barrier; (b) hyaluronidase which provides a mucolytic and spreading factor that enables bacteria to disseminate into the general peritoneal cavity; and (c) lecithinase, an enzyme from *Clostridium welchii*, which can be absorbed into the general circulation to produce a severe toxemia as well as alterations in hemodynamics, and hepatic and metabolic functions. Under favorable conditions these enzymes may be neutralized by antienzymes in the peritoneal cavity or by neutralization by local tissue; otherwise a spreading peritonitis ensues.

This work shows that early surgical removal of the inflamed or gangrenous appendix must be the fundamental rule in the treatment of appendicitis if spreading peritonitis and death is to be prevented. That early surgical intervention is practiced in the Navy is reflected

¹ TANTURI, C. A., and ANDERSON, R. E.: Morbid factors in experimental appendicitis. Surg., Gynec. & Obst. 85: 165-180, Aug. 1949.

in the mortality rate for the six years, 1938, 1939, 1940, and 1946, 1947, and 1948. During this period the total case incidence of appendicitis was 25,497. Of this number 24,956 were operated upon; 41 patients died, a case fatality rate of 0.16 or an annual death rate of 1.4 per 100,000. On the basis of these figures it is probable that not only was early surgical intervention a factor in this low fatality rate but also that in many instances the indication for surgical intervention was based on preventive surgery.



Procaine Block and Carbuncles

Kessler¹ reports a conservative method for treatment of carbuncles, said to have originated in the U. S. S. R. It consists of infiltrating the tissues immediately surrounding the area of infection with 20 to 30 cc. of 0.25 to 0.5 percent procaine. The rationale of this therapy is based on the postulation that the nervous system plays an important role in inflammation and that the reflex arcs originating in the pain receptors of the inflamed area and ending in the blood vessels of the same area "serve to intensify the inflammatory reaction far beyond that necessary to combat the bacterial invasion. Interruption of these reflexes with procaine reduces the inflammatory reaction and aids in returning the involved area more rapidly to a normal state. (Dr. Erwin Gohrbrandt (personal communication))"

Three carbuncles were treated in this manner, one on the abdominal wall, one on the anterior surface of the thigh, and one in the right subscapular area; the diameter of each was from 1½ to 2½ cm. with a surrounding cellulitis of 1 cm. All showed evidence of pointing in more than one area and were extremely painful and tender. Treatment in each case consisted of the administration of 0.09 gm. phenobarbital and infiltrating the tissues 1 cm. from the area of cellulitis with from 15 to 25 cc. of 1 percent procaine hydrochloride. A dry dressing was applied. Relief of pain was obtained in all instances and after the effect of the procaine was lost only slight pain recurred. "In 25 hours all the lesions had lost their intense inflammatory appearance and their cellullitic fringes were fading. In 24 to 48 hours the suppurative areas of the lesions had become inspissated and had sloughed out. In 48 to 72 hours the remaining defects were granu-

¹ Capt. Bruce J. Kessler, MC, Medical Bulletin of The European Command, Medical Division, Vol. 6, No. 7, 1 and 2, July 1949.

lating satisfactorily. From 4 to 6 days after procaine block all the lesions had completely epithelialized."

"The results obtained were generally more gratifying than those obtained with radical treatment. It is possible that more experience with procaine block perhaps combined with penicillin therapy may eliminate the need of incision and drainage or excision of carbuncles."



Book Reviewers

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OFFICERS OF THE MEDICAL DEPARTMENT

Whose Deaths Have Been Reported Since the Last Issue of the Bulletin

BYER, JACOB, Lieutenant Command (MC) U. S. N. R. (Inactive). Died 8 May 1949 at Bronx, N. Y.

EVERIST, CECIL BERTELL, Lieutenant Commander (DC) U. S. N. R. (Inactive). Died 27 April 1949 at Marshalltown, Iowa.

GLASSNER, FRANK, Lieutenant (MC) U. S. N. R. (Inactive). Died 10 February 1949 at Roselle, N. J.

GLINES, PAULINE, Lieutenant Commander (NC) U. S. N. (Retired, Inactive). Died 3 September 1949 at the U. S. Naval Hospital, Long Beach, Calif.

GRUNWELL, ALFRED GILBERT, Lieutenant Commander (MC) U. S. N. (Retired, Inactive). Died 18 September 1949 at the U. S. Naval Hospital, Beaufort, S. C.

KING, PEARL HELEN, (NC) U. S. N. (Retired, Inactive). Died 8 September 1949 at the U. S. Naval Hospital, Long Beach, Calif.

LYNCH, JOHN JOSEPH, Lieutenant, junior grade (DC) U. S. N. Died 4 September 1949 at Princess Anne County, Va.

POSEY, LOUIS CLAIBORNE, Lieutenant Commander (MC) U. S. N. R. (Retired, Inactive). Died 30 April 1949 at Birmingham, Ala.

PUGH, NANCY ELIZABETH, Lieutenant, junior grade (NC) U. S. N. R. (Inactive). Died 21 November 1948 at Nashville, Tenn.

ULEN, HALL, Captain, (DC) U. S. N. R. (Retired, Inactive). Died 3 May 1949 at Louisville, Ky.

WALKER, ALFRED SYLVESTER, Lieutenant Commander (DC) U. S. N. R. (Inactive). Died 16 October 1948 at Miami Beach, Fla.

BOOK REVIEWS AND BOOKS RECEIVED



Publishers submitting books for review are requested to address them as follows:

The Editor,

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(For review)

NOTES: Books marked by symbol ① or ② meet the library requirements for personnel training and are recommended by the Advisory Board, Bureau of Medicine and Surgery.

Symbol ① indicates that the book is recommended for naval hospitals; and symbol ② for dispensaries, dependents service, and medical departments of ships.

CHEMICAL INSECT ATTRACTANTS AND REPELLENTS, by Vincent G. Dethler, A. M., Ph. D., *Professor of Zoology and Entomology, Ohio State University; formerly Entomologist, Inter-allied Malaria Control Commission, Gold Coast, W. W. A.* 289 pages, illustrated. The Blakiston Co., Philadelphia, Pa., publishers, 1947. Price \$5.

In this valuable volume is presented an up-to-date and reliable account of the way in which various chemicals attract and repel insects, in a form which takes into account the fundamental basis of such behavior so far as is known. This subject has long been and still is of the utmost interest to the student of insect ecology. The material presented herein is an excellent example of the varied but related biological phenomena all of which touch directly on a single physiological theme, namely, the relationship of sense of smell and, to a lesser extent, of taste to the behavior of insects. Although the ramifications of this fundamental relationship throughout the field of pure and applied entomology are very complex as illustrated in the text, it is indeed fortunate that this extensive material is now available in such complete and carefully illustrated form by one whose competence for the task is enhanced by his own extensive contributions. The book is written in a fluent and interesting style. The material is intelligently divided into 10 aptly titled chapters. Each chapter contains an excellent bibliography. The material for the book was drawn from a wide source both foreign and domestic. This volume will not only be a valuable adjunct to the library of the scientific investigator but the style is such as to make the subject readily understandable and interesting to the average student of entomology.—S. A. Edgar, *S. A. Scientist (R)*, U. S. P. H. S.

GENERAL CYTOLOGY, by E. D. P. DeRobertis, M. D., *Department of Biology, Massachusetts Institute of Technology*; W. W. Nowinski, Ph. D., *Department of Anatomy, University of Texas Medical School*, and Francisco A. Saez, Ph. D., *Institute for the Investigation of Biological Sciences, Montevideo*. Translated by Warren Andrew, Ph. D. 345 pages, illustrated. W. B. Saunders Co., Philadelphia, Pa., publishers 1948. Price \$5.

This excellent, up-to-date volume of general cytology is the first English edition completely revised of an original work published in Argentina in 1946. The authors have concisely reviewed the generally accepted morphological, physiological, biochemical, and genetical work on cytology and added significant contributions in practically all aspects, including an excellent discussion on the submicroscopic organization of the cell. Discussions of phase microscopy and the electron microscope are particularly timely. Although some of the discussions are somewhat involved, the book has definite value for all concerned with the various aspects of cytology.—*Lt. B. H. Smith (MC) U. S. N.*

HEY GROVES' SYNOPSIS OF SURGERY, edited by Sir Cecil F. P. Wakeley, K. B. E., C. B., D. Sc., F. R. C. S., F. R. S. E., F. A. C. S., F. R. A. C. S., *Fellow of King's College, London; Senior Surgeon to King's College Hospital; Director of Surgical Studies and Teacher of Operative Surgery, King's College Hospital Medical School; Surgeon to the Belgrave Hospital for Children, the West End Hospital for Nervous Diseases, and the Royal Masonic Hospital; Consulting Surgeon to the Maudsley Hospital and to the Royal Navy; Hunterian Professor and Vice-President, Royal College of Surgeons of England; Examiner in Surgery to the Universities of Bristol, Cambridge, Durham, and Sheffield; formerly Examiner in Surgery to the Royal College of Surgeons to the Universities of London, and Glasgow, and to the National Universities of Ireland and Wales; Temporary Surgeon Rear-Admiral to His Majesty's Fleet*. 13th edition. 637 pages, illustrated. The Williams & Wilkins Co., Baltimore, Md., publishers, 1947. Price \$6.

This book is a morass of confused and conflicting ideas and statements and, although written with the avowed intent of including recent developments in surgery, is in many cases 8 to 10 years behind the times. To cite two examples: a recommended form of surgical treatment of gastric ulcer is excision of the ulcer combined with gastro-enterostomy; suggested treatment of carcinoma of the esophagus is x-ray, excision with gastrostomy, or excision with creation of a subcutaneous skin tube to bridge the defect. As an example of the confusion that the book creates the author leans to the neurogenic theory of shock saying the spinal anesthesia can be used to combat shock. Then in the section on anesthesia he says that in a patient already in shock spinal anesthesia will make it worse. And finally he ends with the statement that spinal anesthesia is indicated in the old or extremely debilitated, ideas more or less diametrically opposed to those generally held in this country.

Although this is supposed to be a quick and ready reference book for students and interns it spends valuable time and space on such subjects as tonsillitis, hemophilia, skin diseases, things which will be better covered by other books at the student or intern's command.

As with too many other textbooks the differential diagnosis especially of carcinomatous conditions is based on signs and symptoms which appear only late in the course of malignant disease. If one were to wait for these he would have waited too long to have any hope of curing any patient with malignant disease.

Often one finds dogmatic statements with absolutely no qualification, e. g., casts in simple fractures should be skin tight, and, apparently in spite of the rather recent war the author never heard of a blood bank, for all he says is, "It is claimed that blood can safely be kept in stock till required."

To complete the picture the diagrams are poorly printed and difficult to read.

This book has nothing outside of its convenient size (it can be carried in a coat pocket) to recommend it for anyone's use—*Lt. (jg) J. C. Berger (MC) U. S. N.*

MODERN TRENDS IN DERMATOLOGY, by R. M. B. MacKenna, M. A., M. D. (Camb.), F. R. C. P. (Lond.), *Physician in Charge, Dermatological Department, and Lecturer in Dermatology, St. Bartholomew's Hospital, London; Physician to St. John's Hospital for Diseases of the Skin, London; Honorary Consultant in Dermatology to the British Army; Examiner in Dermatology, Royal Army Medical College.* 432 pages, illustrated. Paul B. Hoeber, Inc., New York, N. Y., publishers, 1948. Price \$8.50.

This volume is a collection of theses, monographs, essays, and reminiscences contained in 18 chapters and represents 23 contributors. There are 32 illustrations mainly on anatomy and mycology.

While the book labors to carry out the theme of modern trends as indicated in the title (and series), it does cover a considerable amount of basic science and its relationship to clinical dermatology. A short section on modern treatment is well done. The outstanding contributions appear, to this reviewer, to be the chapters on Physiology (Cameron and Dobree), Parasitology (Gordon), Mycology (Duncan), and Tropical Dermatology (Fergusson). Chapters on the Prevention of Cutaneous Diseases and Rehabilitation are interesting and timely. The final chapter, "On the Use of Statistics", done with clarity, is a unique and useful inclusion.

The editing and coordination of the material reflects the difficulties of the editor in such a venture; the best writing in the book is Dr. MacKenna's introduction. The repetitive listing of the extensive references in the body of the text, at the conclusion of each chapter, and finally, alphabetically at the end of the book, seems excessive. The index, on the other hand, is inadequate for the scope of the book.—*Capt. R. L. Gilman (MC) U. S. N.*

CLINICAL DIAGNOSIS BY LABORATORY METHODS, A Working Manual of Clinical Pathology, by James Campbell Todd, Ph. B., M. D., *Late Professor of Clinical Pathology, University of Colorado School of Medicine, and Arthur Hawley Sanford, A. M., M. D., Professor of Clinical Pathology, Mayo Foundation, University of Minnesota; Senior Consultant, Division of Clinical Laboratories, The Mayo Clinic, with the collaboration of George Giles Stilwell, A. B., M. D., Division of Clinical Laboratories, The Mayo Clinic.* 11th edition. 954 pages, illustrated. W. B. Saunders Co., Philadelphia, Pa., publishers, 1948. Price \$7.50.

Since the appearance of the first edition in 1908 this book has continued to be one of the leading standard texts in clinical pathology. In the present edition there has been a serious effort to emphasize the newer developments in clinical pathology. Several new chapters have been added, and some have been entirely rewritten. The former chapter in serodiagnostic methods now appears in three shorter chapters, with the serodiagnostic tests for syphilis appearing in the second of these chapters. A complete chapter is now devoted to medical mycology. New material dealing with the Rh blood factor, cardiolipin antigen, antibiotics, and biologic skin tests are included. The illustrations have been rearranged, some of the old ones dropped and new ones added, including several colored plates on blood. Clinical interpretation follows each test and occupies a prominent place throughout the text. An appendix including the composition of various laboratory reagents and solutions, tables of normal values, and an index outline of laboratory findings in important diseases precedes a final comprehensive index. This book is recommended as an authoritative laboratory guide to the medical profession and should be on the shelves of all medical libraries.—*Capt. W. M. Silliphant (MC) U. S. N.*

ACRYLICS AND OTHER SYNTHETIC RESINS USED IN DENTISTRY, by Stanley D. Tylman, M. S., D. D. S., and Floyd A. Peyton, Ph. D. 480 pages, illustrated. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1946. Price \$10.

Although a good part of the material included in this book is probably not original, it is an excellent compilation of data, for the most part, from many sources and as such would serve as a ready reference for those using synthetic resins in the various fields of dentistry. The text gives a complete history of the many early synthetic resins offered to the profession, as well as much of the chemistry, physical properties, methods of processing, indications, and contraindications of the present-day acrylates. Some of the strange phenomena that take place in these resins while being processed as well as after use in the mouth as dentures are carefully explained.

Other useful chapters offered include techniques for the employment of the acrylates in crown and bridge work, methods for the use of resilient resins as soft bases, the making of obturators and splints both surgical and for use in bite and temporomandibular correction. An especially useful chapter is the one on repairs of bridges and dentures. Other chapters on ocular prosthesis and somatoprosthesis are of questionable value. It is, however, recommended as a worth-while addition to the library of any practicing dentist.

—Capt. L. D. Mitchell, Jr. (DC) U. S. N.

TREATMENT BY DIET, by Clifford J. Barborka, B. S., M. S., M. D., D. Sc., F. A. C. P., *Assistant Professor of Medicine, Northwestern University Medical School, Chicago; Attending Physician, Passavant Memorial Hospital; Consultant in Gastro-enterology and Gastroscopy, Diagnostic Center, Hines Veterans Hospital; formerly Consulting Physician, The Mayo Clinic.* 5th edition. 784 pages, illustrated. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1948. Price \$10.

This is the fifth edition of the book which first appeared in 1934.

To read the first chapter entitled "Diet in Health" is to receive a shock to one's complacency, but one long overdue on a neglected attitude toward the human being as something long known to be one subject to erosion, depreciation, obsolescence, and decay much of which can be ameliorated by proper attention and means; one of which is suitable diet. Therefore the need of educating people in the proper use of foods is stressed.

The characteristics and components of foods are discussed at great length in an intelligent manner, and the physiological influences and requirements with an analysis of the needs of the body for many elements are covered in considerable detail. Vitamins are extensively discussed, including their sources and their functions within the body metabolism.

The application of diet as a therapeutic measure is described simply with practical suggestions of the details and a classification of food items and the measurements of servings by household means.

The contents of the book are divided into several parts. Part III takes up most of the work on Diet in Disease, the diseases being divided into four groups. The dietetic considerations for the groups are exhaustively dealt with; much common sense and many practical views are presented. One not only gets the feeling that diet is a means which can be readily and satisfactorily handled, but also the confidence that the practice has its rationale and that there is no mystery in the problem. The statements of what to do are positive.

There are many tables on calories and food items, together with a matching menu for the day, each of which gives the amount of each food then to be taken. In connection with these diets the drug and water requirements also are given attention. Other factors, such as those in obesity, which tend to produce or maintain a disease condition or its association with other conditions, are carefully explained. The physiological features which are not to be overlooked are

brought into the open throughout the text. Diabetes, peptic ulcer, gallbladder, and liver diseases, food allergies, and other bugaboos take on a different picture in these pages. The ample bibliography is listed separately.

This book is considered a complete, authoritative treatise on the question of diet, to be read and reread. It is a book for the general practitioner, for interns, and dietitians, and for anyone professing to advocate dietetic regimes.

—Capt. W. E. Eaton (MC) U. S. N.

A MANUAL OF THE COMMON CONTAGIOUS DISEASES, by Philip Moen Stimson, A. B., M. D., *Associate Professor of Clinical Pediatrics, Cornell University Medical College; Visiting Physician, Willard Parker Hospital; Director, Poliomyelitis Service, The Knickerbocker Hospital; Medical Director, The Floating Hospital of St. John's Guild; Associate Attending Pediatrician, The New York Hospital; Consulting Pediatrician, The Meadowbrook, Bergen Pines, and Norwegian Lutheran Hospitals.* 4th edition, revised. 503 pages with 67 illustrations and 8 plates, 6 in color. Lea & Febiger, Philadelphia, Pa., publishers, 1947. Price \$4.

The fourth edition of this book brings up to date the recent advances in treatment. Each disease is taken up in considerable detail, with excellent sections on differential diagnosis, special isolation techniques for the particular disease, and length of the contagious period.

Separate chapters are devoted to the general isolation technique and on new advances in treatment with the sulfa drugs, penicillin and streptomycin. Sixty-three pages are devoted to poliomyelitis, including all aspects of the disease and the rehabilitation of the patient.

Color photographs are excellent in quality although not numerous. A chart inside the back cover presents the high points of the contagious diseases in convenient form.

This edition is considered excellent material for use aboard ship, for reference on contagious wards, and particularly as a text for use in teaching hospital corpsmen. The style of the writing is pleasant, thus making the subject matter much more interesting than is the case with many texts on contagious diseases.—Commander F. Norris (MC) U. S. N.

NEUROPATHOLOGY IN ITS CLINICOPATHOLOGIC ASPECT, by I. Mark Scheinker, M. D., *Assistant Professor of Medicine (Neurology) and Instructor in Neuropathology, University of Cincinnati College of Medicine; Neuropathologist and Attending Neurologist, Cincinnati General Hospital.* Foreword by Tracy J. Putnam, M. D., *Professor of Neurology and Neurological Surgery, College of Physicians and Surgeons, Columbia University; Director of Services of Neurology and Neurological Surgery, Neurological Institute of New York.* 306 pages, illustrated, Charles C Thomas, Springfield, Ill., publisher, 1947. Price \$6.75.

This practical review of the most frequently encountered neurologic syndromes and diseases is written primarily for the internist and general practitioner. A great deal of the special terminology associated with this subject has been laid aside and the content is expressed, for the most part, in a clear, concise, easily understandable manner.

Approximately one-third of the book deals with vascular diseases. This adequate treatment of an important subject contains much discussion of pathogenesis that is equivocal but thought-provoking. Another large chapter deals with inflammatory diseases. It contains a thorough discussion of virus infections and invasion of the nervous system by yeastlike organisms, protozoa, and rickettsiae. A thorough discussion of syphilis in its major pathological variants is given in another chapter, but tuberculosis is not included in this work.

Dr. Scheinker's chapter on the myopathies is limited to those in which the underlying pathologic alterations are more or less established. This results in a simple classification but detracts from the value of the book as a reference. Other chapters are entitled: Demyelinating Processes, Cerebellar Disorders,

Progressive Degenerative Diseases, Siringomyelia, and Presenile and Involuntional Senile Degeneration. Again, in these chapters, only the most commonly encountered syndromes are discussed.

Each major disease is treated in a uniform manner: a few words of introduction, a concise historical review, a thorough treatment of the pathology and pathogenesis, and a short discussion of clinicopathologist correlation.

A functional dynamic approach to the subject has been the goal toward which Dr. Scheinker has constantly striven. His long interest in the beginnings of disease processes and in the evolution of structural lesions are reflected throughout the work. The omission of subject matter that one would expect to find in such a book was apparently deliberate on the part of the author. This material is to be covered in other books by the author at a later date. The work is adequately illustrated for the most part; the frontispiece is different than most illustrations of the same subject.

This work is recommended for reading by general practitioners and internists; and for library material for those particularly interested in neuropathology, neurosurgery, and neurology.—*Lt. B. K. Black (MC) U. S. N.*

HODGKIN'S DISEASE AND ALLIED DISORDERS, by Henry Jackson, Jr., A. B., M. D., *Assistant Professor of Medicine, Harvard Medical School; Associate Physician, Thorndike Memorial Laboratory, Boston City Hospital*, and Frederic Parker, Jr., A. B., M. D., *Associate Professor of Pathology, Harvard Medical School; Pathologist-in-Chief, Boston City Hospital*. 175 pages, illustrated. Oxford University Press, New York, N. Y., publishers, 1947. Price \$6.50.

This treatise on "Hodgkin's Disease and Allied Disorders" is indeed a contribution to the summarization and outlining of one concept of these diseases. Even the antagonists of the three-stage theory of Hodgkin's disease would have to be impressed by the rather clear-cut lines of distinction and clinical pathologic features of the various stages of Hodgkin's disease as outlined in this book.

The authors present their belief in the concept of Hodgkin's disease as a pathologic state in which there are three distinct varieties. They outline them as the paraganulomatous, granulomatous, and sarcomatous types. Whether they are all neoplasms or infections or, perhaps, some types neoplasm and other types infectious is discussed, but no conclusions in this respect are reached.

The history, etiology, and incidence of all varieties as individual types are discussed. It is in this cataloging into separate types for study purposes that the authors have presented a clearer view of the disease. The pathology, clinical course, differential diagnoses, and treatment are presented. Numerous case histories are summarized to illustrate the statements brought out in the discussions.

Considerable emphasis is placed on the good prognosis in most cases of Hodgkin's disease and the fact that the physician should encourage the patient to productive living for physical as well as psychologic effect. The fact that many of these patients live for 10 to 30 years in relative good health is sufficient to make one cautious in his statements to the patient. To indicate anything other than optimism would be unjust in a disease which is so variable in its clinical course as this disease.

The newer concepts of therapy including nitrogen mustards, surgery, and roentgenology are discussed.

Brief discussion of the related diseases such as reticulum cell sarcoma, lymphocytoma, lymphoblastoma, lymphosarcoma, giant follicle lymphoma, plasmocytoma, and endothelioma is presented. Similarities and differences are portrayed with use of case presentations and photomicrographs for clarification.—*Lt. L. W. Flr (MC) U. S. N.*

DENTAL PRACTICE AND MANAGEMENT, Management, Economics, Ethics and Psychology in Dentistry, by E. R. Swank, B. M., D. D. S. 318 pages; 43 illustrations. Lea & Febiger, Philadelphia, Pa., publishers, 1947. Price \$5.

This well-organized discourse on management, economics, ethics, and psychology in dentistry is dedicated particularly to those civilian dentists who are entering their first years of practice, and is designed to make their journeys along life's highway less perplexing and arduous, more successful and enjoyable.

The author, well aware of the inability of dental educators to furnish graduates with a business background, bridges this gap without subordinating the responsibilities of a dentist to his patients.

Complete in such minuscule details as to where to hang pictures and how to acknowledge introductions, this realistic approach to the conduct of a successful practice leaves no stone unturned. "Trifles make perfection but perfection is no trifle," rings through every page.

The book is designed to help the novice to develop the business skills that must accompany his technical competence if he is to realize a smooth professional career. Valuable as the book should be for civilian dentists, it contains only a limited amount of information useful or applicable to naval dentistry.—*Capt. L. D. Mitchell, Jr. (DC) U. S. M.*

TEXTBOOK OF THE NERVOUS SYSTEM, A Foundation for Clinical Neurology, by H. Chandler Elliott, M. A., Ph. D., *Assistant Professor of Anatomy, Medical College of the State of South Carolina*. With an Introduction by Wilder Penfield, M. D. 384 pages; 158 illustrations, 62 subjects in color with an atlas. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1947. Price \$8.

Dr. Elliott has used a new approach in describing the anatomy of the nervous system. He establishes the basis for his presentation upon psychological principles of learning and teaching and, indeed, does not intend the book to be merely a collection of facts which the reader will forget and never use.

It is for this reason that the book is divided into two parts. In Part 1 the presentation is simple, basic, and clear. The same ground is covered in Part 2 but with more elaboration and detail. The utilization of the "Basic Brain" as a frame upon which to add further details is ingenious and enhances greatly the lucidity of the presentation. It is through the use of this pedagogic mechanism that systems such as the sensory system are clearly and accurately fixed in the mind of the reader. While Dr. Elliott is primarily interested in the presentation of the anatomy of the nervous system, he also includes a great deal of neurophysiology, which also helps the reader correlate anatomical facts and situations. At the end of the book, there is a helpful atlas and an excellent bibliography.

The manner of presentation of a difficult subject makes this book extremely valuable to the beginner in neuro-anatomy and to all who are interested in the nervous system.—*Lt. (jg) A. W. Cook (MC) U. S. N. R.*

A MANUAL OF PHARMACOLOGY AND ITS APPLICATIONS TO THERAPEUTICS AND TOXICOLOGY, by Torald Sollmann, M. D., *Professor Emeritus of Pharmacology and Materia Medica, School of Medicine, Western Reserve University, Cleveland*. 7th edition. 1,132 pages. W. B. Saunders Co., Philadelphia, Pa., publishers, 1948. Price \$11.50.

The text has been carefully revised and brought up to date. The therapeutic discussions are lucid and concise and quite adequate. Sollmann does not always follow orthodox drug groupings but in most instances his practical arrangement is advantageous to those who use the book as a daily guide. Adequate attention has been given to the antibiotics, antihistamines, "nitrogen mustards," and other new areas of drug therapy. The author has taken care to give full instructions for the preparation and administration of the newer drugs. This information should be especially helpful to interns and older physicians.

The index has been expanded and includes the brand names of many new drugs. The index is direct and is notable for the absence of the annoying directions to "see under" other titles. The bibliography exceeds 100 pages and provides a rich source for information regarding original papers and for complete articles on most major subjects. This is an invaluable part of the book for research workers and students.

Sollmann's manual of pharmacology is not only a well-established "standard" but this latest edition is recommended for students, interns, practitioners, and research workers in pharmacology.—*Commander W. P. Briggs (MSC) U. S. N.*

NEUROLOGY OF THE OCULAR MUSCLES, by David G. Cogan, M. D., *Associate Professor of Ophthalmology, Harvard Medical School; Director, Howe Laboratory of Ophthalmology, Boston, Mass.* 214 pages; illustrated. Charles C Thomas, Springfield, Ill., publishers, 1948. Price \$6.

This compact comprehensive text presents a remarkable guide to an understanding of the subject of neuro-ophthalmology. The presentation of the subject matter deviates from the usual in that objective localizing signs and symptoms relating directly or indirectly to ocular motor disturbances are emphasized rather than the etiologic factors.

The neuro-anatomic and neurophysiologic architecture related to the objective study of the clinical disturbances of the extraocular muscles are presented in an orderly manner.

The first 4 chapters are concerned with the pharmacologic, physiologic, histologic, and neuromuscular characteristics of the extraocular muscles. Chapters 5, 6, and 7 correlate the supranuclear connections of the ocular motor system, the associated lesions involving the connections, and the resultant objective findings. Chapter 8 discusses the significant pupillary disturbances.

The last chapter is devoted to the complex subject of nystagmus. Here the author has succeeded in an exemplary manner in simplifying and clarifying this subject. The subject is discussed under a classification of pendular and jerk nystagmus. Jerk nystagmus is further subdivided into nystagmus of optokinetic and vestibular origin.

The illustrations are well chosen to aid in an understanding of the subject matter.

The bibliography is ample. The compilation of 825 references at the end of the text is evidence of the attempt of the author to resolve accurately the state of present knowledge of neuro-ophthalmology and then present it in a format especially adapted as a comprehensive guide for students of this subject.

—*Commander S. H. Oliver (MC) U. S. N.*

BOOKS RECEIVED

Receipt of the following books is acknowledged. As far as practicable, these will be reviewed at a later date.

THE PHYSIQUE OF YOUNG ADULT MALES, by W. J. Martin. Medical Research Council Memorandum No. 20. 66 pages. His Majesty's Stationery Office, London, publishers, 1949. Price 1s. 3d.

NUTRITION AND PHYSICAL FITNESS, by L. Jean Bogert, Ph. D., *Formerly Instructor in the Department of Medicine, University of Chicago; Instructor in Experimental Medicine, Yale Medical School; and Lecturer in Chemistry, Connecticut Training School for Nurses, New Haven; Professor of Food Economics and Nutrition, Kansas State Agricultural College, Manhattan, Kans.; Research Chemist, Obstetrical Department, Henry Ford Hospital, Detroit, Mich.*, 5th edition. 610 pages. W. B. Saunders Co., Philadelphia, Pa., publishers, 1949. Price \$4.25.

- HISTOPATHOLOGY OF IRRADIATION FROM EXTERNAL AND INTERNAL SOURCES**, edited by William Bloom, M. D., *Professor of Anatomy, Department of Anatomy, and Institute of Radiobiology and Biophysics, University of Chicago*. 808 pages. McGraw Hill Book Co., Inc., New York, N. Y., publishers, 1948. Price \$8.
- CORONARY ARTERY DISEASE**, by Ernst P. Boas, M. D., *Associate Physician, Mt. Sinai Hospital, New York, N. Y.*, and Norman F. Boas, M. D. 399 pages. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1949. Price \$6.
- FUNDAMENTAL CONSIDERATIONS IN ANESTHESIA**, by Charles L. Burstein, M. D., *Chief, Department of Anesthesiology, Hospital for Special Surgery, Attending Consultant in Anesthesia, Veterans Administration Hospital, Bronx, N. Y., Assistant Visiting Anesthetist, Bellevue Hospital, Instructor in Anesthesia, New York University College of Medicine, New York, N. Y.* 153 pages. The Macmillan Co., New York, N. Y., publishers, 1949. Price \$4.
- THE STORY OF SCABIES**, Volume I, *The Prevalence (Civil and Military), Prevention and Treatment of Scabies, and the Biology of Acarus Scabiei, from the Earliest Times to the Beginning of World War II*, by Reuben Friedman, M. D., *Associate Professor of Dermatology and Syphilology, Temple University School of Medicine; Fellow of the College of Physicians of Philadelphia; Member of the Philadelphia Dermatological Society, American Academy of Dermatology and Syphilology, Society for Investigative Dermatology, and American Association of the History of Medicine; Corresponding Member of the Italian Society of Dermatology and Syphilography; Diplomate of the American Board of Dermatology and Syphilology*. Foreword by Carroll S. Wright, M. D., *Professor of Dermatology and Syphilology, Temple University School of Medicine*. 468 pages, with 114 illustrations and 36 tables. The Froben Press Inc., New York, N. Y., publishers, 1947. Price \$7.50.
- COMROE'S ARTHRITIS AND ALLIED CONDITIONS**, by the late Bernard I. Comroe, completely revised and rewritten by 17 leading rheumatologists, under the editorial direction of Joseph L. Hollander, A. B., M. D., F. A. C. P., *University of Pennsylvania, Philadelphia, Pa.* 1,108 pages, 370 illustrations. Lea & Febiger, Philadelphia, Pa., publishers, 1949. Price \$16.
- AN ATLAS OF ELECTROCARDIOGRAPHY**, by William Dressler, M. D., *Cardiologist, Maimonides Hospital, Brooklyn, N. Y., Consultant in Cardiology, the Brooklyn Hospital, Lecturer in Medicine, Long Island College of Medicine, Brooklyn, and Hugo Roesler, M. D., F. A. C. P., Cardiologist, Department of Medicine, Associate Professor of Radiology, Temple University Medical School and Hospital, Philadelphia, Pa.* 502 pages, 310 illustrations. Charles C Thomas, Springfield, Ill., publishers, 1949. Price \$14.
- PATHOLOGY AND SURGERY OF THYROID DISEASE**, by Joseph L. DeCourcy, M. D., *Senior Surgeon, Good Samaritan Hospital, Director, DeCourcy Clinic, Cincinnati, Ohio; and Cornelius B. DeCourcy, M. D., Member, DeCourcy Clinic Surgical Staff, Cincinnati, Ohio*. 476 pages. Charles C Thomas, Springfield, Ill., publishers, 1949. Price \$10.
- CARE OF THE SURGICAL PATIENT**, Including Pathologic Physiology and Principles of Diagnosis and Treatment, by Jacob Fine, M. D., *Surgeon-in-Chief, Beth Israel Hospital; Professor of Surgery at Beth Israel Hospital, Harvard Medical School*. 544 pages. W. B. Saunders Co., Philadelphia, Pa., publishers, 1949. Price \$8.
- CORNELL CONFERENCES ON THERAPY**, Volume III, edited by Harry Gold, M. D., *managing editor; David P. Barr, M. D., McKeen Cattell, M. D.; Eugene F. DuBois, M. D.; Walter Modell, M. D.; and Ralph R. Tompsett, M. D.* 337 pages. The Macmillan Co., New York, N. Y., publishers, 1948. Price \$3.50.
- CLINICAL AUSCULTATION OF THE HEART**, by Samuel A. Levine, M. D., *Clinical Professor of Medicine, Harvard Medical School; Physician, Peter Bent Brigham Hospital; and W. Proctor Harvey, M. D., Research Fellow in Medicine, Harvard Medical School, Assistant in Medicine, Peter Bent Brigham Hospital*. 327 pages, illustrated. W. B. Saunders Co., Philadelphia, Pa., publishers, 1949. Price \$6.50.
- AESCULAPIUS COMES TO THE COLONIES**, *The Story of the Early Days of Medicine in the Thirteen Original Colonies*, by Maurice Bear Gordon, M. D. 560 pages. Ventnor Publishers, Inc., Ventnor, N. J., publishers, 1949. Price \$10.
- MYCOSES AND PRACTICAL MYCOLOGY**, *A Handbook for Students and Practitioners*, by N. Gohar, M. R. C. S. (Eng.), L. R. C. P., *Assistant Professor, Parasitology and Mycology, Department of Clinical Pathology, Kasr el Ainy Faculty of Medicine*.

Fouad I University, Cairo, Egypt. With a Foreword by Sir Philip Manson-Bahr, C. M. G., D. S. O., M. A., M. D., D. T. M. & H. (Cantab.), F. R. C. P. (Lond.). 234 pages. Williams & Wilkins Co., Baltimore, Md., publishers, 1948. Price \$6.

THE FUNDAMENTALS OF PULMONARY TUBERCULOSIS AND ITS COMPLICATIONS, For the Student, the Teacher, and the Practicing Physician. Sponsored by the American College of Chest Physicians. Editor, Edward W. Hayes, M. D.; editorial committee, Andrew L. Banyal, M. D., Herman Hilleboe, M. D., J. Arthur Myers, M. D., and J. Winthrop Peabody, M. D. 480 pages. Charles C Thomas, Springfield, Ill., publishers, 1949. Price \$9.50.

TUMORS OF BONE, by Charles F. Geschickter, M. D., *Professor of Pathology, Georgetown University Medical School, Consultant in Pathology, U. S. Naval Medical School, Consultant in Pathology, Mt. Alto Veterans' Administration Hospital, Washington, D. C.; and Murray M. Copeland, M. D., Professor of Oncology, Georgetown University Medical School, Consultant in Surgery, Gallinger Municipal Hospital, Washington, D. C.; Special Consultant, Federal Security Agency, Public Health Service, Cancer Control Branch, Washington, D. C.* 3d edition. 810 pages, 642 illustrations. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1949. Price \$17.50.

MEDICINE THROUGHOUT ANTIQUITY, by Benjamin Lee Gordon, M. D., *Member, American Association of the History of Medicine, and American Academy of Ophthalmology and Otolaryngology, Certified by American Board of Ophthalmology, Attending Ophthalmologist to Shore Memorial Hospital, Somers Point, N. J., and to Atlantic County Hospital for Tuberculous Diseases, and Atlantic County Hospital for Mental Diseases, Northfield, N. J., Authorized Medical Examiner for Civil Aeronautics Administration, Dept. of Commerce, Washington, D. C., Author of "The Romance of Medicine."* Foreward by Dr. Max Neuburger. 818 pages, 157 illustrations. F. A. Davis Co., Philadelphia, Pa., publishers, 1949. Price \$6.

OCULAR SIGNS IN SLIT-LAMP MICROSCOPY, by James Hamilton Doggart, M. A., M. D. (Cantab.), F. R. C. S. (Eng.), *Surgeon and late Research Scholar, Moorfields, Westminster and Central Eye Hospital; Ophthalmic Surgeon, St. George's Hospital; Lecturer in Ophthalmology at St. George's Hospital Medical School; Ophthalmic Surgeon, Hospital for Sick Children, Great Ormond Street; Late Senior Open Foundation Scholar, King's College, Cambridge.* 112 pages, 93 illustrations, 85 in colour. The C. V. Mosby Co., St. Louis, Mo., publishers, 1949. Price \$6.75.

NURSING CARE OF NEUROSURGICAL PATIENTS, by Roland M. Klemme, M. D., F. I. C. S., F. A. C. S., *Professor of Surgery, Saint Louis University School of Medicine, St. Louis, Mo.* 117 pages. Charles C Thomas, Springfield, Ill., publishers, 1949. Price \$3.

NEUROLOGICAL AND NEUROSURGICAL NURSING, by C. G. de Gutierrez-Mahoney, M. D., *Some-time Fellow of the Rockefeller Foundation; Associate Professor of Neurology, Vanderbilt University School of Medicine, Nashville; Senior Neurosurgeon, United States Army Air Forces (Colonel, MD, AUS); Director of the Neurological Division and Neurosurgeon-in-Chief, St. Vincent's Hospital, New York, N. Y.; Neurosurgical Consultant, Fort Totten Army Medical Center, New York, N. Y., and Esta Carini, R. N., B. S., Formerly Head Nurse and Supervisor of the Neurological and Neurosurgical Services, Neurological Institute, Presbyterian-Columbia Medical Center, New York, N. Y., Clinical Instructor of Neurological and Neurosurgical Nursing, St. Vincent's Hospital, New York, N. Y.* 515 pages, illustrated. The C. V. Mosby Co., St. Louis, Mo., publishers, 1949. Price \$5.75.

FUNDAMENTALS OF INTERNAL MEDICINE, by Wallace Mason Yater, A. B., M. D., M. S. (in Med.), F. A. C. P., *Director, Yater Clinic, Washington, D. C., Formerly Professor of Medicine and Director of the Department of Medicine, Georgetown University School of Medicine; Physician-in-Chief, Georgetown University Hospital; Physician-in-Chief, Gallinger Municipal Hospital, Washington, D. C.; and Fellow in Medicine, The Mayo Foundation.* 3d edition. 1,451 pages. Appleton-Century-Crofts, Inc., New York, N. Y., publishers, 1949. Price \$12.

PRACTICAL LESSONS IN PSYCHIATRY, by Joseph L. Fetterman, M. D., *Director, The Fetterman Clinic, Cleveland, Ohio; Formerly, Assistant Clinical Professor of Nervous Diseases, Western Reserve University School of Medicine; Executive Officer, School of Military Neuropsychiatry; Ret. Diplomate, American Board of Neurology and Psychiatry.* 324 pages. Charles C Thomas, Springfield, Ill., publishers, 1949. Price \$2.75.

- ANUS-RECTUM-SIGMOID COLON, Diagnosis and Treatment**, by Harry E. Bacon, B. S., M. D., F. A. C. S., F. A. P. S., F. I. C. S., F. R. S. M., *Professor and Head of Department of Proctology, Temple University Medical School and Hospital; Head of Department, St Mary's Hospital; Formerly Associate Professor Graduate School of Medicine, University of Pennsylvania; Consultant; Rush Hospital for Tuberculosis, National Stomach Hospital, Douglas Hospital, Mercy Hospital, Shriners Hospital for Crippled Children, Paul Kimball Hospital, St. Christopher's Hospital, and Stetson Hospital; Honorary Fellow, Society Medicine (Lond.), Ambrose Pare Surgical Society (Paris), Piemontese Surgical Society (Turin, Italy), Venezuelan Surgical Society, Peruvian Surgical Society, Miembro Correspondiente Extrajero De Argentina, Sociedad Brasileira de Proctologia, Pan-American Gastroenterologic Society (Rosario), Detroit Academy of Surgery, Hollywood Academy of Medicine; Diplomate American Board of Surgery; Secretary Qualification Board International College Surgeons; Member American Board of Proctology; Director American Cancer Society; President American Proctologic Society.* 3d edition, in 2 volumes. Volume I, 540 pages, and Volume II, 586 pages. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1949. Price \$80.
- CLINICAL CYSTOSCOPY, Technic, Procedures, Diagnosis, Treatment**, by Lowrain E. McCrea, M. D., F. A. C. S., F. I. C. S., *Clinical Professor of Urology, Temple University Medical School; Attending Urologist, Philadelphia General Hospital; Civilian Consultant in Urology, Valley Forge General Hospital.* Drawings by B. Engle Shaffer. 2d edition, in 2 volumes. Volume I, 586 pages, and Volume II, 565 pages; with 742 illustrations, 201 in color. F. A. Davis Co., Philadelphia, Pa., publishers, 1949. Price \$28.
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